JANUARY, 1925

Railway Engineering and Maintenance

RAILWAY ENGINEERING AND MAINTENANCE
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The Tunkhannock Viaduct on the Delaware, Lackawanna & Western.

Railway Engineering and Maintenance

Formerly the Railway Maintenance Engineer

Vol. 21 January, 1925 Number 1

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WOULD YOU LIKE TO KNOW

Where uniform track forces are maintained?

What the railways will spend in 1925?

How much it costs to spray paint?

How to order treated timber for bridge work?

If sawdust and cinders are useful in protecting pipe lines from frost?

Answers to these and other questions will be found in this issue.

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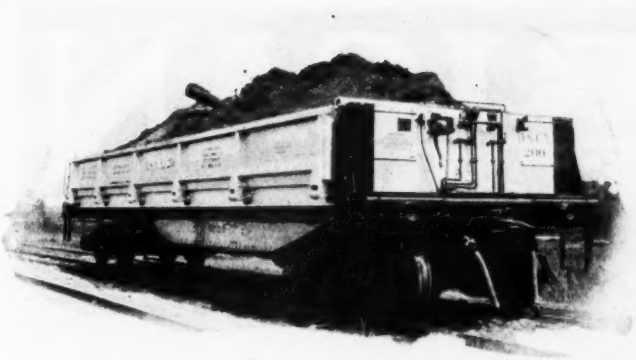

All-steel, rugged construction

Keeps the ballast clean

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Dumps its load well beyond the ends of the ties. Keeps the ballast clean.

Can be partially dumped. Distributes the material as desired (*The body is under control of the operator at all times*). Can be loaded by hand at floor level. (*4'-6" above rail*). Is not subject to shocks and strains usually found in dump cars. Is absolutely safe—accidental dumping impossible. Dumps even the stickiest material (*reaches discharge angle of* ***50*** *degrees*). Offers no obstruction to discharge of huge boulders—clear opening, dumps to either side with equal facility. Simplified control.

Ask for Bulletin D-12

THE DIFFERENTIAL STEEL CAR CO.
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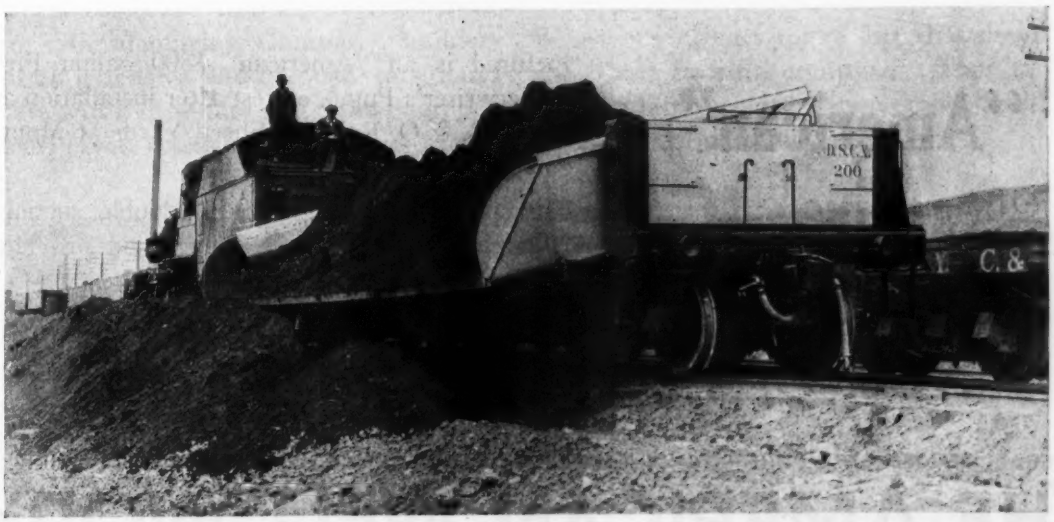
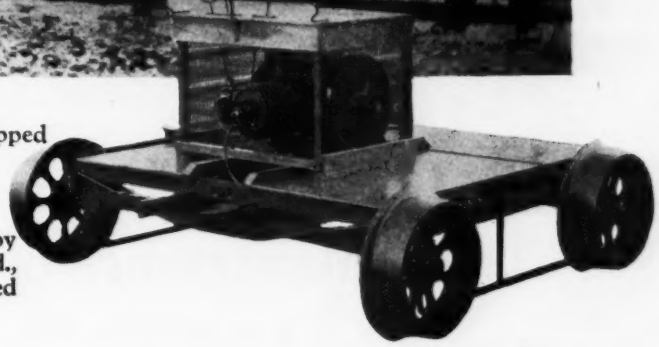


Material can be dumped in desired quantities. Body under control in all positions

Sylvester 4¾ H. P. hand car engine pushing a Hyatt equipped lorry loaded with 5200 lbs of rails and six men up a steep grade.



Featherweight one man car built by The Sylvester Manufacturing Co., Ltd., Lindsay, Ontario, Canada. Equipped with Hyatt bearings.

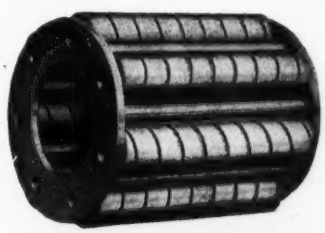
Better Maintenance Cars From Newfoundland to Vancouver

ON the far-flung lines of the Canadian Railways, Hyatt equipped cars are making a record which rivals their performance in the United States.

These roads are supplied by The Sylvester Manufacturing Company, builders of an extensive line of push cars, hand cars and motor cars—all types equipped with Hyatt roller bearings.

Railroad men everywhere know Hyatt bearing cars for their easy running, their economy of fuel, lubrication and maintenance, and their long life with entire freedom from bearing repairs, adjustments or replacements.

When buying cars, make sure that they are Hyatt bearing equipped. That is your guaranty of dependable and economical operation.



[Hyatt bearings can now be had also for standard heavy railway cars. *Write for information.*]

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HYATT ROLLER BEARINGS FOR RAILWAY MAINTENANCE CARS

Makes Cinders Easily and Cheaply Available for Maintenance of Way Work

Substitute Air for Labor

Air operation means rapidity of service (no overtime)

AIR operated Extension Side Dump Cars are decidedly profitable in Cinder Service. They not only offer an efficient, positive and economical method of unloading—but cinders are made easily and cheaply available far from the source of supply. This in itself is an important item in maintenance of way work.

The illustration below shows 12 Extension Side Dump Cars unloading cinders for filling in purposes 15 miles from the Engine Terminal. The cars are unloaded quickly by one man and returned for reloading.

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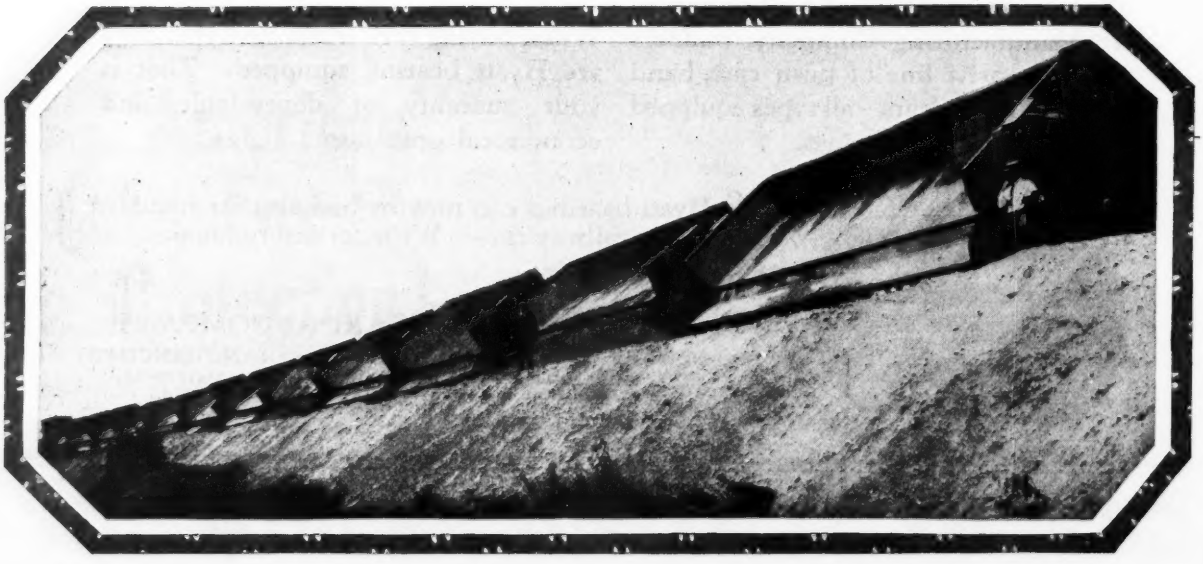


Figure 8 test track on which cars are run until worn out to determine value of improvements before application to regular models.

Fairmont cars are tested under various loads and speeds and in all kinds of weather.

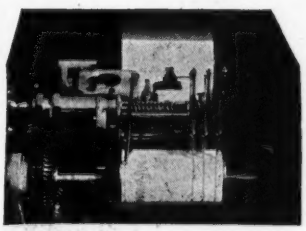
Fairmont M2 (standard series) Section Car being tested for fuel economy while carrying 8 men and tools. Data being automatically recorded by the Recording Dynamometer.

Reaching Ahead to Still Greater Economy!

On leading railroads Fairmont Railway Motor Cars are the standard of comparison in efficient, economical operation. And they are daily breaking their own records.

Despite this remarkable performance Fairmont Engineers are constantly striving for even greater economy. Elaborate tests that others might deem needless expense prove on track under actual working conditions the fitness of every new feature before adoption.

Railroads appreciate this service and the wider margin of comfort, safety and economy assured by Fairmont improvements as is evidenced by the fact that over 50% of all the cars manufactured each year are FAIRMONTS.



The Measuring Stick of Motor Car Values

The recording dynamometer gives in a few hours accurate data that heretofore years of careful observation could only approximate. It measures:

1. Maximum draw bar effort available for starting trailers.
2. Maximum draw bar pull at all speeds.
3. Maximum draw bar horse power at all speeds.
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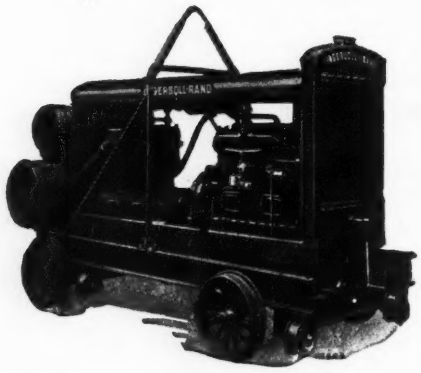
Fairmont

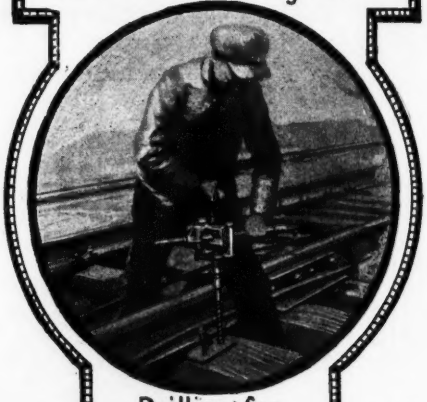
Ball-Bearing Motors and Railway Motor Cars

No 5 Rail Bonding Drill

Labor-Aiding Pneumatic Methods



No 19 Rail Bolting Drill



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Three sizes 5"x5" Operates 4 tampers
7"x6" " 8 "
9"x8" " 12 "

Or for operating any of the other tools shown here and used in track construction and maintenance operations.

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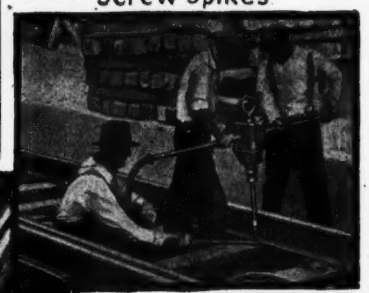

Driving Screw Spikes

Rail Drilling

Grinding Switch Points

R-529

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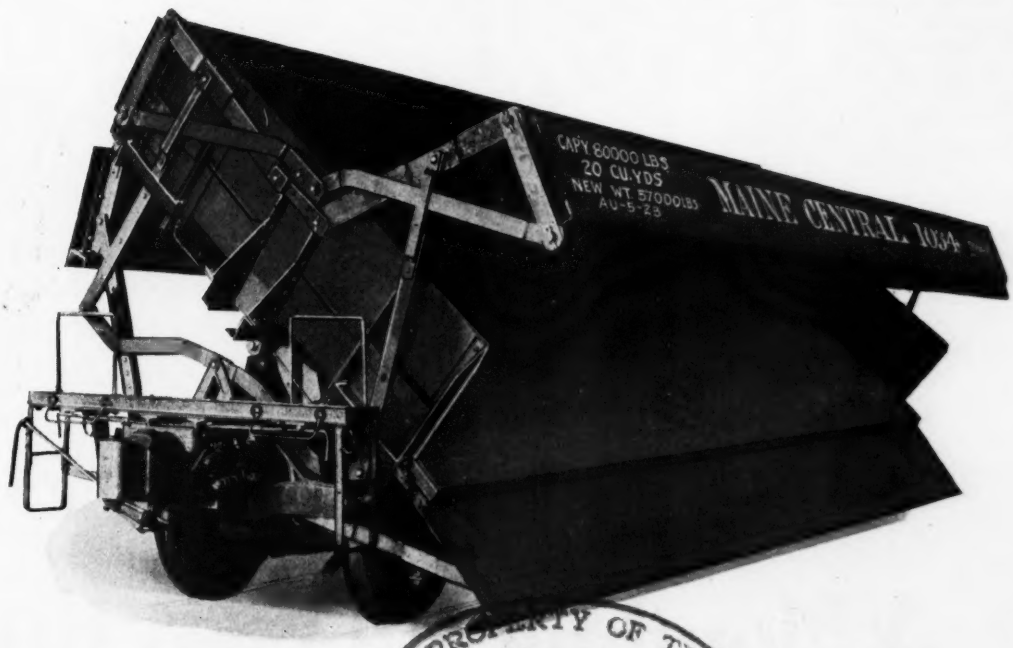
Dumps Either Way and Instantly



Superb for maintenance work—Western Automatic 20-yard Air Dump Car

May we refer you to Railroads using this Western Apron Car that you may convince yourself of its superiority for your own needs?

This is the car which many railroads have installed. The Extension Floor or Apron added to the well-known distinctive feature of Western Cars make it an ideal dump car for railroad work.

Western

That's Why

Facts That Will Appeal

1. It is dumped and righted automatically by air.

2. It can be dumped either way instantly without change of cylinders or other mechanism.

3. A steel Apron, 28 inches wide, operates automatically to throw the load beyond the ballast.

4. The Apron folds away from the load and the car rights instantly, without shovelling or moving up.

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Earth and Stone Handling Equipment

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On 17° 20" Curve Under Heavy Coal Traffic

FEW railroads are operating under conditions imposing greater stress on tie plates than 17° 20" curves, or subjecting ties and rails to greater wear than that sustained under the heaviest coal traffic.

Under such traffic conditions Lundie Tie plates **have held track to rigid gauge—having added 75 per cent to rail life—with practically no mechanical wear on ties after four years of service.**

These qualities have served to demonstrate convincingly to an eastern road the unmistakable value of Lundie Tie Plates.

These definite savings to this road are proven economies—the result of correct tie plate design as embodied only in the Lundie Tie Plate.

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LUNDIE
TIE PLATE

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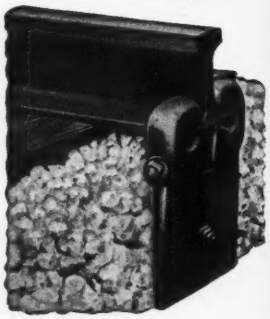


Rail Anchor

Note Excellent condtion of tie after 8½ years service.

Railway Engineering and Maintenance

Volume 21 January, 1925 Number 1

THE 1924 INDEX IS READY

THE INDEX of *Railway Engineering and Maintenance* for the 12 issues of 1924 is available for distribution and will be sent without charge to those who request it. Subscribers who bind their copies or those who for other reasons desire to have this index are asked to advise the editor to this effect and it will be sent promptly.

THE FEBRUARY ISSUE WILL BE DELAYED

OWING TO the fact that the American Wood-Preservers' Association and the National Association of Railroad Tie Producers' were unable to secure hotel accommodations in Chicago during the third week in January, the time at which these associations normally meet, it has been necessary for them to postpone their conventions until the first week in February. In order to bring the proceedings of these associations to the attention of our readers promptly and because of the further fact that the March issue of *Railway Engineering and Maintenance* will be devoted exclusively to the consideration of labor saving methods and equipment it has been decided to hold the February issue from the mails for approximately ten days in order that complete reports of these meetings may be presented in that number. This announcement is written in order that our readers may know the reason for their failure to receive the February issue on the accustomed date.

MORE EVIDENCE ON WINTER WORK

IN our last issue we presented an article by G. L. Moore, engineer maintenance of way of the Lehigh Valley, describing the manner in which the year's rail allotment of that road is laid during the winter by the regular section forces. In this issue we present an article by W. P. Wiltsee, chief engineer of the Norfolk & Western, describing the manner in which rail is relaid on that road during the winter by the use of extra gangs. While the form of organization for doing this work differs on the two roads, the object is the same, namely, the utilization for this work of forces which are required on other work during the remainder of the year, thereby stabilizing employment to this extent by completing a portion of the year's program when other activities are at a low ebb.

The laying of rail during the winter is a development of the last few years. It is not long since a suggestion to this effect would have been received with derision. Yet with reasonable precautions it has been proved practical on numerous roads and is being adopted more generally each year. It is a recognition of the growing sentiment among railway officers that maintenance work must be distributed more uniformly throughout the year if the force is to be brought to that standard of efficiency which is essential to the most economical conduct of the the many and detailed operations in this field of work.

THE EARLY BIRD

ALL indications point to greater industrial activity in 1925. This is particularly true of the railways. Information furnished the Railway Age by roads with approximately half of the mileage of the United States abstracted in another column, indicates that the railways of the United States and Canada will spend over $1,350,000,000 for additions and improvements to their facilities during the year now opening or at least 15 per cent more than during either of the last two years. This will be appropriated for all of those facilities which comprise a railway.

Of particular interest to engineering and maintenance of way employees is the fact that more than two-thirds of these expenditures will be devoted to the improvement of tracks and structures, a larger proportion than in any recent year. This fact, combined with the magnitude of the preparations themselves, assures that the engineering and maintenance of way officers will be called upon to do considerably more work during 1925 than in any recent year.

There is an old saying that forewarned is forearmed. With these facts concerning the railways as a whole and with access to more specific information concerning the program of their individual roads, it is none too early for engineering and maintenance officers to begin to plan their season's work in order that they may be able to handle it to the best advantage and complete it as early as possible. The value of an early start was demonstrated in a striking manner in 1923. Facing a program of work larger than any which had been encountered up to that time, the roads launched their activities so early in the spring that they made surprisingly rapid progress, avoiding a labor shortage and completing their work economically and without a late season rush.

There is much to support the belief that the traffic which the railways will be called upon to handle during 1925 will exceed all previous records. There are some who believe that it will surpass the record of 1923 to such extent as to shatter the prevalent complacency of railway managers regarding the capacity of their facilities and to tax their resources to the limit. If this occurs, and past experience offers any criterion, the roads will embark on many new proects with feverish haste, adding thereby to the problems of an already overburdened organization. Those roads will be best prepared to undertake such additional work, if the necessity arises, which have their regular work furthest towards completion. If, on the other hand, the necessity does not arise, they will have lost nothing but will have com-

pleted their regular program at the season when it can be handled most economically. In any event, therefore, it would appear to be the part of prudence to begin the marshaling of men and of materials at once in order that the season activities may be undertaken at the earliest possible date.

WHAT OF 1950?

THE beginning of a new year is always an occasion for retrospection as to the accomplishments of the past and for speculation as to the prospects of the future. We are now entering on the year which will complete the first quarter of the twentieth century, a period which has been marked by a tremendous advancement in our industrial life. What may we expect in the next 25 years?

The development of the motor vehicle and the construction of enormous mileages of improved highways has made this a critical period in the transportation field. A new agency is making a place for itself. Judging from the developments of the last few years we may expect that this will result in the widespread abandonment of minor branch lines by the railroads. On the other hand, the growth of traffic on the railways as a whole has been so rapid that it is only by the appropriation of enormous funds for additional facilities that the carriers are enabled to meet the demands of service. Therefore, with the elimination of the unproductive lines of light traffic and the intensified development of the important parts of the American railway systems, we may confidently expect a marked advance in the standards of track construction on the railways as a whole.

What will this mean with respect to the design of the tracks of the future? Sections of rail heavier than any now in use will be developed, beyond any doubt. But what is more certain is that the average weight of rail in all tracks will be much greater than at present. It is also certain that improvements will be made in the quality of rail. Present developments in the treating of the wearing surface, for example, offer much promise in the way of increased service, and surely, it is not too much to expect that the cause of the transverse fissures will eventually be discovered and the necessary steps taken to eliminate them entirely.

An improvement in the rail joint is much to be desired, but considering the limited advance along this line during the first quarter of the century the outlook is not especially bright. The most tangible advance in this respect is in the use of fewer joints by providing longer rails and we may expect that the 39-ft. length now being adopted will represent but a stepping stone in the direction of still greater lengths.

Judging from the lack of progress in the devolpment of a substitute for the wooden crosstie, there is little prospect of any revolutionary change in this feature of the track structure. But one thing is certain, that not many years will elapse before the use of untreated wood in the track will be deemed little short of criminal. By the same token, tie plates and rail anchors, or a combination of the two serving the same purpose, will be considered as essential in the track structure as the rail joint is today. Whether any marked change will be effected in the fastening of the rails to the ties cannot be foretold at this time, since less attention is given to the screw spike today than 15 years ago.

The scarcity of wood and the abandonment of less important lines will have their effect on the character of the roadway structures. Heavier and more permanent bridges will be the rule in the future. It is true that the change will take place slowly, but surely another 25 years will see the disappearance of the open deck untreated timber trestles. The outcome of the contemporary competition between concrete and creosoted timber will be determined not so much by considerations of the relative merits of these two forms of construction as by the growing scarcity of timber, while experience with concrete construction and studies of existing concrete structures will result in the development, not so much, of new types as of better workmanship and consequently real permanence of construction.

But of far greater moment than the type of construction applied to tracks and bridges as affected by the needs of the traffic of the future, will be the change which must be made in the organization and methods applied in maintenance work. The problems of the future will be more intricate, the volume of the expenditures will be far greater and the need for economy much more urgent than now. The present development in the use of labor saving equipment is not a fraction of what the future has in store. It suffices to say, that no operation attending maintenance of way work which requires the application of any considerable degree of energy in large volume will be performed by human hands.

In the face of such changes it goes without saying that technical training for the more important positions in the service will be absolutely necessary. But equally imperative will be a marked improvement in the calibre of the rank and file of the organization. Men will be needed who possess sufficient intelligence to operate all manner of power tools and their work must be directed by foremen who are qualified to take responsibility, not only for the performance of skilled labor but for the care and effective operation of intricate equipment.

Workmen and foremen qualified to meet these requirements are not to be had under the methods now generally pursued by the railroads in the conduct of maintenance of way work. Nor is there any prospect that the problem will be less difficult in the future. Better methods will have to be developed for the recruiting of men of

THE RECORD OF 1924

The American railroads are the most economically operated in the world. They established new records for efficiency and economy in 1924. Translated into dollars, this efficiency resulted in a saving to the shipping public of the United States of approximately $600,000,000 in reduced freight rates alone, as compared with the ratio in effect in 1921.

Ten new high records were established by the railroads in 1924, among which were (1) the moving of the greatest freight traffic in any one month in history, 43,109,743,000 net ton miles in October; (2) the loading of more cars with revenue freight in a week than ever before, 1,112,345 cars in the week ending Oct. 25; and (3) the moving of the greatest number of loaded and empty freight cars in a single day in history, 1,030,211 cars on Oct. 15. During all of this period the roads had a minimum daily average of nearly 100,000 surplus freight cars in good repair.

This record service to the American public was made possible in no small measure by the loyal co-operation of maintenance of way employees in keeping the tracks and structures in proper condition for the movement of traffic without delay or interruption.

high calibre, for insuring that those of greatest promise are provided with work the year around, for training them in the duties of their positions and for providing lines of promotion that will be effective in retaining good foremen in the service.

The solution of these problems may bring about drastic changes in the form of organization. It may lead to a segregation of the major operations from those of policing, large gangs being organized to handle the work requiring the employment of power equipment in order that this may be employed in useful service for a maximum part of the time. Another possible development is the organization of track maintenance in large section gangs covering greater territory. But whatever the solution, it will be effected only as maintenance of way officers devote time and study to the problem—not at some time in the future but today. Differences in the character of structures and the methods of conducting maintenance work in 1950 as compared to 1925 will not be brought about as a revolution. They will come through a gradual development from year to year. Nineteen twenty-five will have as large a part in this transition as any subsequent year. Now is the time to begin.

MOTOR CAR MAINTENANCE

THE MOTOR car has become a standard unit of equipment of maintenance of way gangs on practically all but the most heavily traveled lines. Its economy is so generally recognized that it is no longer a topic of discussion. Yet in spite of this universal use of cars and the fact that individual railways have invested upwards of a half million dollars in them, the methods of supervising their operation and of maintaining them on the average road are in the earliest stages of development. It is in the refinement of these methods that the greatest improvement in motor car operation may be expected in the next few years.

A motor car is built for use. Every day that it is out of service the investment in it is unproductive. More serious than this, however, is the disorganization of the work of the gang which follows the failure of the car to operate. The criterion of the efficiency of maintenance of the cars is the percent of the time they are in condition for service. A comparison of this percentage on different roads and on different divisions of the same road will demonstrate the present shortcomings in this respect. An indication of the improvement which it is possible to effect on many roads is afforded by the experience of one road on which the proportion of cars in service was increased more than ten percent following the reorganization of its methods of maintenance.

Second in importance only to the proportion of the time that the cars are in service is the cost of keeping them in condition for service. This cost exceeds $100,000 annually on numerous roads and approaches a quarter of a million dollars on some. An expenditure of this amount warrants close supervision particularly because the outlay is made at a large number of widely scattered points, yet it is only now beginning to receive the attention its magnitude justifies.

A study of the repair costs of cars will reveal many interesting facts. The repeated renewal of certain parts will indicate shortcomings in design or in materials which can be corrected. As an illustration, a chance inspection of a defective wheel on one road recently led to the disclosure that similar results were being experienced with other wheels from the same shipment and resulted in the replacement of the entire lot by the manufacturer. A study of this character will also bring to light faulty practices in the operation of the cars which can be corrected by proper instruction of the users, supplemented by discipline when necessary. The opportunity for improvement here can be demonstrated by comparing the service secured from the same type of cars by different foremen, some keeping their cars in working condition indefinitely while those of other foremen require overhauling at frequent intervals. It is only by the development of some comprehensive plan for the supervision of repairs that deficiencies in materials and in practices can be detected and corrected.

Equally worthy of consideration with the manner of making the more important repairs are the methods of making minor adjustments and repairs to the cars in the field. A common complaint against motor cars and one which has some foundation in fact is the real or fancied necessity for the foreman or some member of his gang to devote a certain amount of time to working on the car to the detriment of his work on the track or structures. While this does not enter into the record of the cost of maintaining the cars, it is nevertheless as direct a charge as that incurred in the repair shops. Some roads have eliminated this in large measure at least by placing a motor car maintainer on each division or district, whose duty it is to travel back and forth over this territory making minor adjustments and thereby obviating the necessity for the foreman to devote his time to such work and also insuring a higher standard of maintenance.

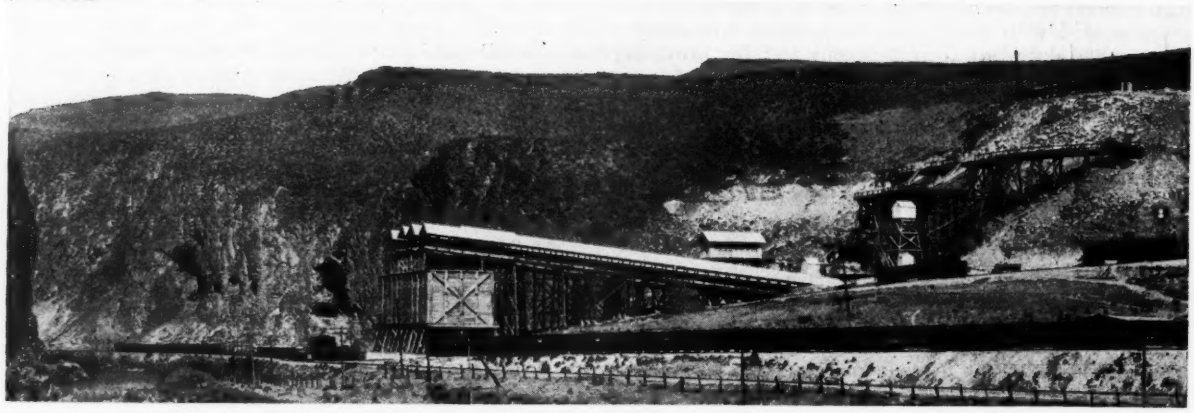
The fact that the nature and extent of the supervision of motor car maintenance vary so widely on different roads indicate that the maintenance of way department has much opportunity for improvement in the care of its motor cars, both in increasing the proportion of the time that the cars are in condition for the use for which they are purchased and in reducing the cost of maintaining them in this condition.

A WASTE THAT CAN BE ELIMINATED

ONE OF THE most common and at the same time one of the most inexcusable demands on the time of track forces during cold weather is the necessity for the removal of ice about water columns or tanks. Some small accumulation of ice is to be expected at such points, but the larger part of that found at most stations is the result of the carelessness of locomotive firemen in flooding their tanks or in swinging the spouts clear of the tenders before the discharge of water has been stopped. When such water falls on frozen ground it freezes quickly and repeated waste gives rise to the necessity for the expenditure of labor to remove the ice. Any labor so expended is wasted inasmuch as the necessity for its expnditure can be avoided in most cases if proper remedial measures are taken by operating officers.

It is the duty of maintenance employees to see that water delivery facilities are properly maintained so that leakage is eliminated or reduced to the minimum and that drainage is afforded for that which normally escapes. Beyond this point they are dependent upon the co-operation of operating officers in insisting that engine employees exert sufficient precautions in taking water to prevent the flooding of the track, reinforcing their instructions by disciplinary action whenever necessary to eliminate the abuse.

The difficulties under which track men are forced to work during severely cold weather and the special demands made on them at that time to keep switches and other facilities in operation and platforms free of snow and ice are sufficient to warrant the elimination of all practices which add to their burdens. Maintenance officers can curb this waste by bringing all such conditions to the attention of the proper officers.



The Crushing and Loading End of the Palisade Works

Southern Pacific Builds Rock Crushing Plants With Large Output

Three Installations on Western Lines Produce Over 4,000 Cubic Yards of Ballast Daily

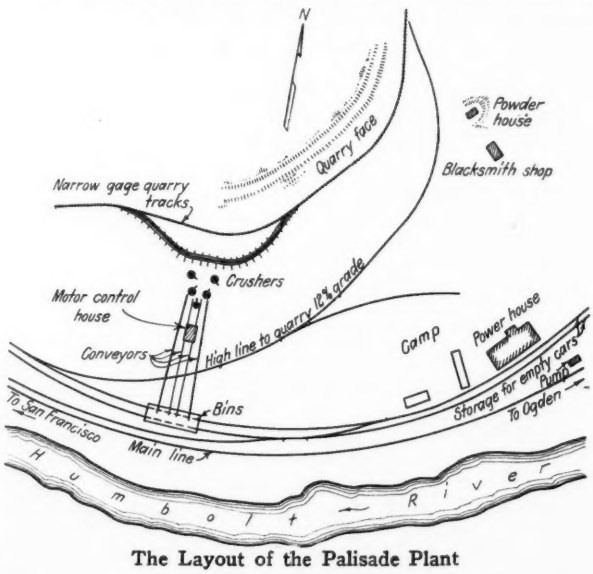
AS a result of a decision to use rock or slag exclusively for ballasting its main line tracks, the Southern Pacific has constructed and now has in operation three rock crushing plants on its Pacific system, which are believed to be the largest and most modern installations of their kind west of the Mississippi river. These plants at Lucin, Utah, Palisade, Nev., and at Santa Margarita, Cal., have been producing 4,500 yd. of ballast daily, the Lucin and Palisade plants being immediately engaged in furnishing 2,000,000 yd. of rock for ballasting the Salt Lake division between Imlay, Nev., and Ogden, Utah, a distance of 398 miles. The installations include crushers capable of handling 36 in. rock, which are driven by electricity produced by internal combustion engines of 300 hp.

Rock Requires Blasting

The plants were located at Lucin and Palisade to afford a minimum haul for the large yardage required for the initial work on the Salt Lake division. The installation at each point consists essentially of two parallel plants, each composed of primary and secondary crushers, with their screens and conveyors, and a reject crusher which serves both units. Primary crushers were installed in both instances to break up the quarry run rock as a means of producing ballast at the lowest possible cost. Where primary crushers are employed the ideal is to have equipment that will receive any rock that passes the dipper of the steam shovel. However, the investment which can be justified for primary crushing necessarily depends somewhat upon the nature of the rock and the sizes to which it breaks when blasted, as well as the conditions under which operations are carried on and the ultimate yardage to be produced.

At Lucin the ballast is obtained from an old sedimentary formation of quartzite which has been completedly shattered by natural forces. The rock breaks well under the coyote hole method of blasting and permits the use of primary crushers with a 24 in. opening. The Palisade quarry, located near the Palisades of the Humboldt river, is in a volcanic formation of successive lava flows of purplish rhyolite, interbedded with a small amount of volcanic glass. This formation is too dense for the coyote hole method of blasting, but by means of column loading in blast holes made with well drills, this rock is also broken up into sizes which permit economical production with primary crushers of the same size as at Lucin.

At Palisade, where the plant is similar to that at Lucin,



The Layout of the Palisade Plant

the quarry is located well upon the slope of the rise north of the track and extends several hundred feet back from the track along the face of a draw. The quarry floor is 110 ft. above the track on which the ballast is loaded out for shipment and is reached from the main line by a standard gage spur which extends up the draw on a maximum grade of 12 per cent. The quarrying is accomplished with the aid of two heavy all-steel blast hole drills,

The East End Showing the Power Plant in Foreground

with the usual jack hammer and pneumatic equipment, which operates on the side slope above the quarry floor. The blasted rock is picked up by two steam shovels operating on the quarry floor and loaded into quarry cars which are then hauled to the crusher, the equipment for this purpose comprising three dinky steam locomotives and side dump cars of 4 yd. capacity. At Palisade the quarry cars and locomotives are narrow gage but at the other plant standard gage equipent is uesd throughout. All repairs to the rolling stock as well as to the quarry machinery are made on the quarry floor, where a blacksmith shop, provided with an oil furnace, a fish oil tempering bath and a drill steel sharpening machine, is located for the purpose.

Operation of the Quarry

The loaded cars reach the crushing plant on a shoo-fly trestle of timber built out from the face of the cliff. The cars are dumped two at a time over four grizzlies into the primary crushers. These crushers, like all of the others, are of the gyratory type and are supported on concrete piers.

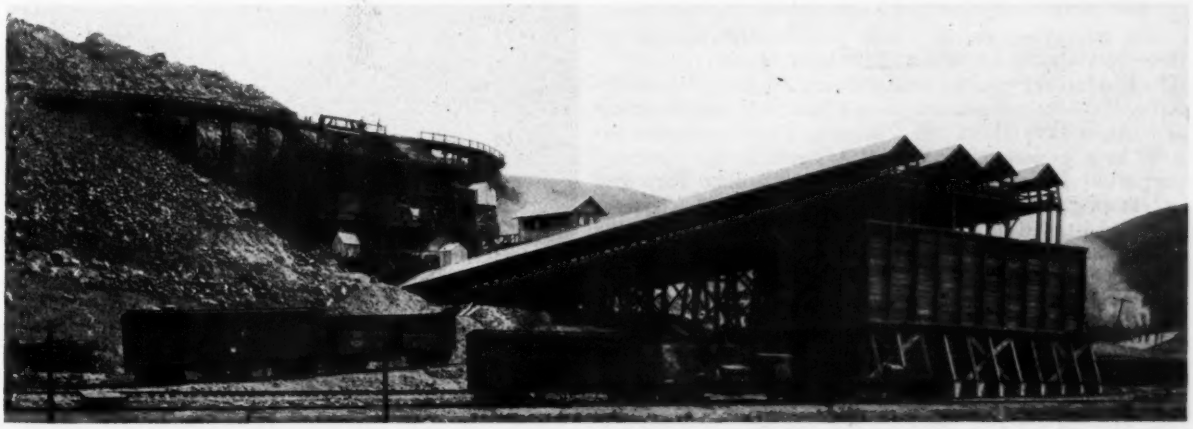
On a timber platform a short distance down the hill from each of these crushers is a revolving stone screen with a drum 60 in. in diameter and 16 ft. long, perforated with 2½ in. holes. The material passing through this screen is further separated by a jacket over the drum, having ½ in. perforations beyond which the rock feeds into a chute on one side of the screen and the screenings into a chute on the other side, which carry them down the slope to the conveyors. That rock which fails to pass through the perforations in the large revolving screen feeds into a smaller crusher which in turn discharges into a 48-in. by 12-ft. revolving screen perforated similarly to the first one. The oversize aggregate from both sides of the plant is conducted to a third crusher that discharges the rock into a small bucket elevator which feeds the aggregate back through the two 48 in. screens.

After all of the material is screened and in the chute it is then ready for the final operation, which is to concentrate it for loading into cars for shipment. This is accomplished by feeding the rock and screenings onto belt conveyors which carry them out on covered runways of timber 220 ft. long to a three-compartment bin 100 ft. long, 32 ft. wide and 25 ft. deep built over the two loading tracks. There are four conveyors in all, two 30 in. wide, for the rock, each discharging into a separate bin, and two 14-in. conveyors for screenings, both of which discharge into the center compartment of the large bin.

The loading of cars is accomplished through 12 discharge gates of the self-closing type in the bottom of this bin over the two loading tracks. The operation of the cars under the bin is entirely by gravity. The cars are spotted on a track above the bins by a road engine and are passed through the bins and out on the loaded tracks by a quarry loading crew. A rip track is provided for minor repairs at this point.

Plants Have Large Output

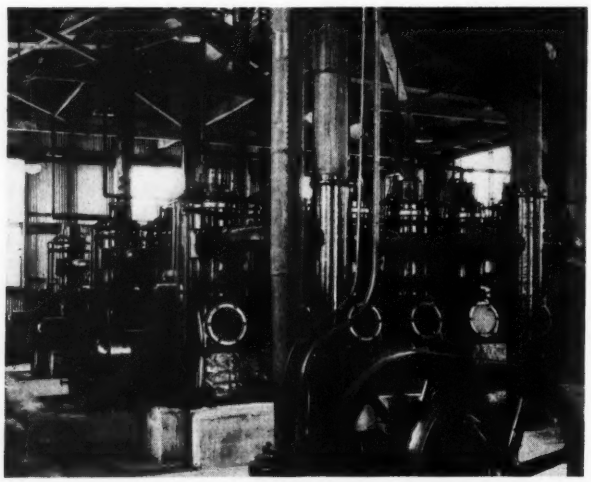
Both the Palisade and Lucin plants are designed for continuous outputs of 1,300 cu. yd. of rock per day. Because of the difference in the formation of the rock,



A Close Up of the Loading Facilities at Palisade

the Lucin plant, however, has averaged nearly 2,000 yd. per day over an extended period and on several occasions has crushed 3,000 yd. in one day.

In considering the design of these crushing plants the power question offered the greatest single opportunity for economy. It was found that almost every other operating saving depended directly or indirectly upon the power supplied. A first class steam plant was considered but it was concluded that the fixed charges on such an installa-



The 300 H.P. Engines in the Power Plant

tion would be prohibitive because of the intermittent operation of the crushing plant. Furthermore, maintenance costs and depreciation would be greatly increased by the periodical shutdown to which these plants are subject. Weather conditions on the Salt Lake division, for instance, are rather severe, making the working season very short and the heavy traffic of late summer and fall curtail still further the time available for the extensive application of ballast to track, and hence the operation of the plan.

It was obvious that the ideal power would be electricity, since this would not only allow individual electric motor drives for all machines but it could be used advantageously in other operations on the quarry. But with no transmission lines in the vicinity the problem was to get the electricity. This question was settled by building generator plants on the site of the crusher work, using internal combustion engines for prime movers. The wisdom of this move has since been demonstrated.

Electricity Generated by 300 HP. Gas Engines

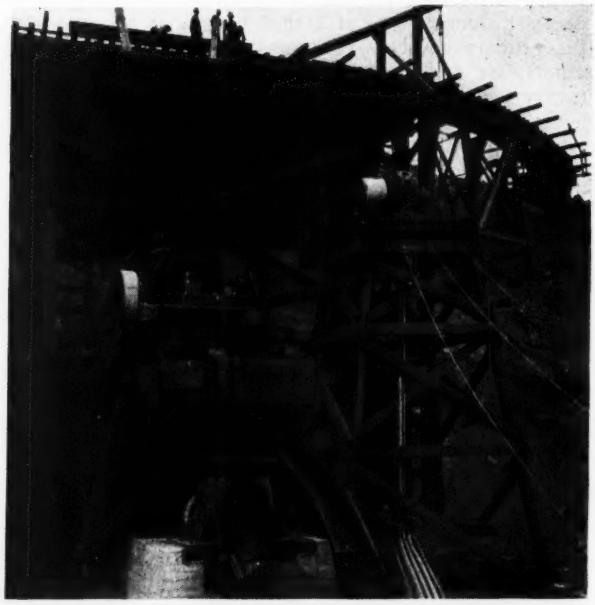
The equipment in the Lucin powerhouse consists of three, 300 hp. six-cylinder Fairbanks-Morse type "Y" oil engines, each direct-connected to a 250 kv.a., 460 volt, 3 phase, 60 cycle generator, with 10 kw., 125 volt excitors and an auxiliary 15 hp. type "Y" engine belt-connected to a 10 kv.a. generator and a 1 kv.a. excitor for starting purposes. Similar equipment is installed at Palisade except that the prime movers are 200 hp. This equipment is installed in a corrugated metal powerhouse, well lighted and ventilated with windows and transoms. Electric power at 440 volts is carried to motor control houses at the plant in heavy copper cables laid in a wooden flume for protection, thence by overhead busses to individual switches for each machine where independent motors are installed. The motors are of the slip-ring wound rotor type and are controlled by a street car type controller having resistance for starting only. All motors are under control of an operator stationed in the motor control house, which is so located that all machinery is under observation at all times. As a safety precaution, remote control pushbuttons are provided at each machine, allowing immediate shutdown of any machine in case of emergency.

This control system, together with the semi-Diesel prime movers and the duplicate arrangement of the machinery, provide a highly pleasing and economical operation of the plant. If any piece of machinery should be shut down for any reason it affects only one side of the plant. While under test it was found entirely practical to get the crusher plant in operation within 15 min. of the time the power plant operators went to work, although the engines had become cold after an all-night shut down. As far as expense is concerned, calculations show that a saving is made of about 13 cents per yard of rock delivered to the bin over the cost with the steam driven plant. For a full plant capacity of 100 cars each 10 hours this represents a total reduction in cost of $429 per day. by the style of plant adopted.

As a further comparison, the best record made in the most modern steam driven plants on the Southern Pacific is 215 kw. hours per barrel of fuel while the tests at Lucin and Palisade show more than double this output. Some allowance must be made for the difference in cost of the crude oil used in the steam plant and the oil used in the combustion engine, but even when this is taken into consideration there is still a saving in operating cost alone of approximately 65 per cent in favor of the oil engine.

Santa Margarita Plant Has 36-in. Crushers

At Santa Margarita, on the Coast division, an entirely different quarrying and crushing problem was encountered. The quarry site is about two miles from the railroad, necessitating the construction of a spur through fairly rough country before the development of the



The Arrangement of Crushers and Screens

quarry and plant construction could be started. The plant site is precipitous, making the construction much more difficult and the erection of the heavy machinery a slow process.

The rock is an extremely hard granite overlaid principally with a varying thickness of decomposed granite.

The nature of this rock is such that it breaks in large sizes under power, even when using well drill shots. This necessitates considerable block holing in the quarry and called for the largest possible primary crusher for handling the dislodged material.

The largest crusher available was a No. 18 gyratory type having a 36-in. opening. This crusher weighs more than 400,000 lb. and its erection on a foundation 70 ft. above the loading track was a serious problem. The secondary crushers are two No. 9 gyratories placed on each side of the No. 18. This arrangement allows the plant to operate if the large crusher or any of its auxiliaries should be shut down for any reason. The rock is handled from the No. 18 crusher to the two No. 9 crushers by two bucket elevators having 36 buckets. A No. 4 reduction crusher and two No. 6 gyratory crushers constitute the remainder of the crushing equipment while four 60-in.

The Santa Margarita Plant

by 16-ft. screens and two 48-in. by 12-ft. screens with dust jackets serve the crushers and segregate the ballast rock and screenings.

All of these machines are electrically driven with individual motors from a control house located in a central location similarly as in the case of the other two plants, but since a high tension power line runs close to the quarry, it was possible to secure electricity without installing a power plant. The provision made consists simply of a sub-station with three 200 kw. transformers for the purpose of reducing the voltage to that suitable for all needs.

The Santa Margarita quarry is operated with a 4 yd. tractor-mounted steam shovel and standard 20 yd. side dump cars, which are hauled to the crushers by a 50-ton locomotive. A blacksmith shop fully equipped with oil furnace, sharpening machines, etc., is provided on the quarry floor as at Lucin and Palisade, and a 1-yd. gasoline-driven shovel mounted on tractor treads is utilized in handling overburden and digging the trails for the blast hole drills. This plant has an average capacity of about 1,200 cu. yd. per day and has been constructed to produce rip rap as well as ballast, there being a potential need for a large quantity of rip rap along the Salinas river.

The plants were designed in the office of W. H. Kirkbride, engineer maintenance of way and structures, and were constructed by the regular divisional forces, under the immediate direction of W. M. Jaekle, assistant engineer maintenance of way and structures. All three plants were built and put into operation within a period of eight months from the time work was begun.

Norfolk & Western Favors Uniform Track Forces

By W. P. Wiltsee
Chief Engineer, Norfolk & Western

IT IS self-evident that constant and steady employment makes more satisfied, and consequently, more efficient employes; it also produces men trained and skilled in the work they are performing. Many of our railroads are located in territories where certain classes of work can be carried on throughout the year. Where the winters are not too severe, such work as the laying of rail and the building of fences and to some extent the placing of ties in side and other unimportant tracks, can be done to advantage, as well as such small construction work as is usually handled by extra gangs.

For the past two years we have been laying our rail during the winter months, from November to March or April, inclusive, instead of following the old custom of laying it in the summer time. This has the advantage of keeping certain extra gangs employed continuously, using them during the summer months for ballasting and during the winter months for laying rail. Track work in tunnels is done in the winter time wherever possible. This has resulted in some of the most efficient extra gang forces we have ever had, notwithstanding the generally decreased efficiency of track labor in recent times. By being able to furnish continuous employment we have been able to hold good men and to train them to do their work better than that performed by ordinary labor. One of the principal disadvantages of laying off gangs in the fall or winter and starting up again in the spring is that it requires at least sixty days to get a new gang to the point where it is an efficient and smooth-working organization. During this time probably not more than 50 per cent as much work is accomplished as would be done by a well-organized and smooth-running outfit composed of men who are experienced from the start of operations.

The retaining of these extra gangs during the winter also gives us a nucleus from which other extra gangs can be made up later, and keeps the camps, tools and other supplies intact. It enables us to build up gangs quickly and do more work at the outset when the spring season opens. It also offers an inducement for a better class of men to seek employment. By having certain extra gangs thus employed in the winter time, we also have men to draw on for quick work in case of trouble such as slides, washouts, wrecks and other emergencies. While there are a number of wet and extra cold days during the winter when the men cannot work to advantage, they are laid off during such weather, and therefore labor is not wasted during that time.

There is no question in the minds of the maintenance of way officers of this company that it is economical to employ forces continuously in this manner, thus stabilizing them as far as is possible. Naturally there is a point beyond which it would not be economical to carry this, but with reasonable diligence on the part of those responsible for carrying on such work, no trouble should be experienced from that score.

Bridge and building men are regularly employed throughout the year, working on bridges in the summer time and on the repair of stations and buildings during the winter, it being necessary, however, to reduce the number of men in these gangs to some extent during the winter months. Section forces can be kept employed throughout the year, except that during the winter months it is advisable to reduce the number of men to some extent. There is a great deal of work, however, that sec-

tion forces can do in the winter time besides attending to the usual winter work of cleaning snow from switches and around stations. This company requires its forces to repair and build new fences during the winter months. Other work that can be done by section forces during the winter months is the building up of the shoulders on roadbed, scaling of rock cuts, etc.

By providing continuous employment, we not only keep better laborers but better foremen. The experience of the Norfolk & Western railway, so far as it has gone in the employment of men throughout the year, has proven that it is wise and economical to handle maintenance work in this manner. It is difficult to estimate just how much saving results from continuous employment, but we are all satisfied that the saving is considerable, due to the more efficient employees.

Use Explosive to Remove Old Cinder Pit Walls

By W. J. Apperson
Assistant Engineer, Illinois Central, Clinton, Ill.

WHILE making some recent improvements at the terminal of the Illinois Central at Clinton, Ill., it was necessary to convert three small cinder pits into one large pit in order to provide the additional capacity made necessary by the increasing business in that territory. In designing the new pit it was thought more economical to make use of some of the old walls of the old pits by leaving them in place, joining the old outside walls of these three pits with new ones of similar construction. Two of the three old pits were built for single track, each being able to accommodate one engine at a time, while the third, nearest the roundhouse, was a double pit.

The new pit was designed as an extension of the double pit and to include the two single pits. This arrangement

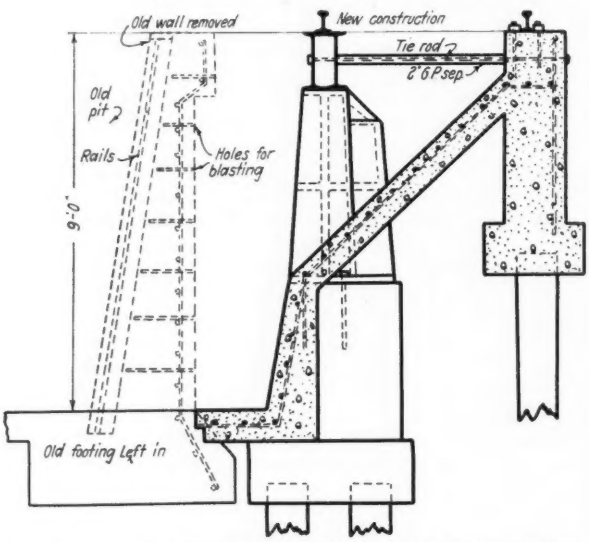


Fig. 1—How the Inner Walls of the Single-Track Pits Were Removed and the Second Track Construction Was Added

made it necessary to remove the inner walls of the old pits, namely, one end wall of the double pit, two ends and one side wall of the middle pit and one end and one side wall of the other single pit.

In removing these walls after the walls of the new pit were in place, blasting was employed together with the use of a steel battering ram. The side walls of the single pits were removed entirely by blasting with dynamite. In order to apply the dynamite, holes were drilled well into the face of the walls at intervals of about twelve inches in both directions. These holes were loaded with 1½ sticks of dynamite each, and fired. An electric blasting outfit was used to good advantage as it would allow the firing of several charges at a time. These small charges

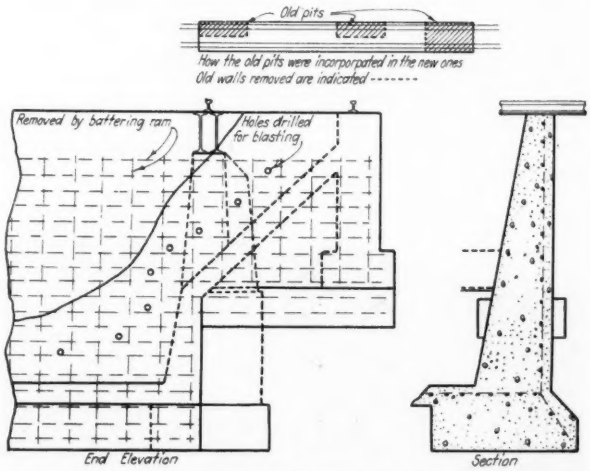


Fig. 2—End View of the Old Double-Track Pit Showing How the Old End Wall Was Removed

tended only to shatter the walls and loosen the concrete from the reinforcing bars, allowing the pieces to be removed. The reinforcing bars were then cut away from the remaining walls and floors of the pits by means of an acetylene torch. In order to prevent damage from small flying fragments the pits were covered with the platforms ordinarily used to cover them while not in use. This work was done under contract by A. W. Stoolman.

The end walls, on account of the working space being more favorable, were first shattered by the use of a heavy battering ram. The ram used in this case was a heavy piece of steel about nine feet long and six or eight inches in diameter, ordinarily used in the machine shops for driving steel wedges. This ram was suspended from a locomotive crane while six men swung it against the wall. In this way a large portion of the concrete in the thin upper part of the wall was removed, leaving only about three feet of the old wall projecting from the sides of the walls left in place. As these walls were constructed with a batter, the lower portion was too heavy for the successful use of the ram, but was easily removed by dynamite as described above. These end walls were removed by company forces.

Blasting of this nature can be done very satisfactorily without damage to any portion of the other parts of the structure and with greater rapidity and considerably less expense than by the usual method of chisel and sledge. It was not necessary to discontinue the use of the old pits, as the work of dynamiting was done on one while engines were being cleaned on the other two and the old pits were left in place until the walls of the new pit were entirely complete and ready for use.

Figure 1 is a section showing how the side walls were removed and the new construction was added to enlarge the pit to accommodate a second track. It shows the position of the holes drilled in the old walls for dynamite charges. Figure 2 shows the section of the end wall of the double pit which was removed in making the extension.

Mechanical Painting Reduces Costs*

The Use of Spray Equipment Lends Itself Readily to All Classes of Maintenance Work

THERE SEEMS to be no limit to the practical application of spray-painting in industrial upkeep. Walls, ceilings, floors, beams, interior and exterior surfaces may be successfully treated in this manner. Even woven-wire factory fencing may be spray-painted with satisfaction. In one practical painting job six men (two operators, two men to strain paint, etc., and two men to move scaffolding) applied

Painting a Brick Wall

Painting Cement Stucco

sufficient flat interior paint to cover 58,000 sq. ft. of surface in two days. The cost of application, not including the cost of paint, was about $0.0013 per sq. ft. of surface. The use of the spray gun for applying two different types of metal paints has proved very efficient, as will be noted from the results charted below:

Red Lead

	Surface Area, Sq. Ft.	Paint Used, Gals.	Time 1 Man, Hours.
Spray machine	2,208	6	1.86
Hand brush	2,208	7½	16

Red Oxide

	Surface Area. Sq. Ft.	Paint Used. Gals.	Time 1 Man, Mins.
Spray machine	1,170	1¾	16
Hand brush	1,170	2½	150

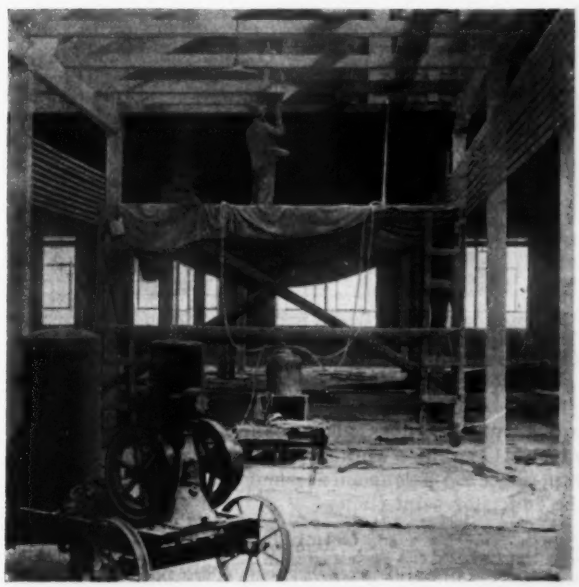
Spray Equipment Produces Uniform Consistency of the Paint

One manufacturer of spray guns has made an interesting experiment to show the constancy of composition of paint as it leaves the nozzle of the gun. In the test with a certain paint containing a rapidly settling pigment, the machine (with air agitation) was stopped at three different periods and samples were taken from the nozzles. Three different paints were used in each test, making nine samples in all. Analysis of the paint showed a variation between pigment and vehicle of an approximate average of one-tenth of 1 per cent. Similar samples taken from the brush operator showed a variation of slightly more than 19 per cent in some cases.

There is a great advantage in using the spray gun in certain types of industrial painting. For instance, in finishing the inside of the roof of a building constructed of corrugated steel sheeting, the spray gun is far superior to the brush method, for the following reasons: (1) Because the air blast preceding the paint spray helps to drive away existing dust or paint scale. Do not be misled by this statement, however, in the belief that surfaces to be painted with the spray machine do not require preparation for painting. Follow the same directions for preparing the surface as are recommended for brush work. (2) The spray gun drives the paint between the lap joints of corrugated steel roofing and seals in the structural steel joints. (3) The spray gun will project the paint through the corrugated arches where the sheet lies on top of the roof beams and structural siding supports. In this way the tops of the roof beams, plates and rivets are sealed in with a coat of paint. It is impossible to reach and cover surfaces of this kind with the paint brush.

Mechanical Painting Reduces the Amount of Man Hours

In considering the spray method of painting, three things must be given consideration, i.e., durability, cost of application and cost of paint. Experiments have



Painting the Timbers in a Frame Building with a Machine.

shown that a well designed paint, properly prepared for spray application, will penetrate the pores; and that, aided by the impact of the paint striking the surface, a better bond and more uniform coating is applied than when the brush is used.

For hand-brush work a building must be laddered or scaffolded, so that the painter can come within arm's length of his work. The setting and placing of ladders

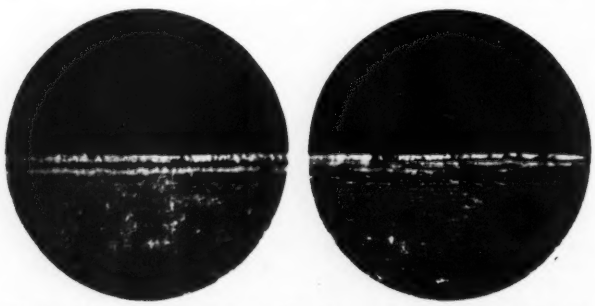
* The second of two articles abstracted from a chapter on spray painting from the book entitled "Principles and Practices of Upkeep Painting," edited by Roy C. Sheeler and published by E. I. DuPont deNemours & Co., Inc., Philadelphia, Pa. The first article was published in the December issue, Page 493.

and scaffolds represent a large portion of the expense of some jobs. In spray painting a large amount of the scaffolding is eliminated, as the operator does not have to work so close to the surface, and by the employment of an extension sprayer he can cover a surface 10 to 15 ft. distant. The width of the average paint-brush stroke employed in applying paint to a building is 3 in. to 4 in. and to cover the surface at least two passes across the work are necessary. The average width of the spray stroke is 10 in., and the flow of paint is graduated so that only one pass across the work is necessary. Recently spray guns have been put on the market that project a flat fan-type spray that is from 28 in. to 30 in. wide. With these spray guns large surfaces can quickly be given a fine, uniform coating.

The Amount of Paint Material Varies

The general opinion among those who have used the spray machine for industrial painting is that spraying takes somewhat more paint than brushing. This is a condition that can be controlled at the will of the operator, as the flow and projection of paint from the nozzle of the gun can be graduated from a thin frosting to a heavy flow coat. The experienced hand brusher and the experienced spray operator both know the correct thickness of coating to apply in order to secure best results on different classes of work.

The question may arise regarding the health of the operators and the effect of inhaling small amounts of paint that have been finely dispersed throughout the air. This is an important consideration, particularly when working in rooms where there may be insufficient ventilation. The use of a mask is advised under such circumstances. However, spray machines have been improved in construction, so that it is now possible to secure



Photomicrographs of Cross Sections of Wood Coated with (Left) Spray Gun, First Coat White, Second Coat Red, Third Coat White; (Right) Hand Brush, First Coat White, Second Coat Red and Third Coat White.

equipment that does not produce an excess of flying vapor. Operators working with modern spray machines experience no inconvenience and are in no danger from the effects of paint fumes.

Conclusions

Experiments and practical tests have proved:

That the spray machine can successfully handle paint of practically any weight per gallon;

That much greater speed can be attained in spray-painting as compared with brush work;

That practically no difference exists in the appearance of spray work compared with brush application, with the exception that in some instances the surface shows slightly better hiding with the spray as compared with the brush;

That the apparent loss of paint in the form of a fine mist is in reality very trifling, amounting to possibly no more than one or two per cent of the paint consumed.

That a simple form of respirator should be used, particularly for interior work extending over a considerable length of time;

That superior work can be done with the spray machine on surfaces or under conditions making brush application impractical or extremely difficult;

That in many instances a satisfactory finish can be obtained with one spray coat, while two coats may be necessary when applied with the brush;

That practically anyone can be taught the use of the spray gun in a very short time;

That spraying requires in most instances more paint than brush application, but the slightly increased cost of the paint is offset greatly by the lower labor cost;

That the durability of spray painting is in most instances as good as that of brush work, and frequently better;

That labor is saved through the fact that one spray operator can accomplish with less effort as much work as can be done in the same time by three to five brush hands;

That material is saved by the application of fewer coats and the ability of the operator to adjust the paint gun to deliver the exact thickness of coating desired; and

That spray painting, when correctly performed, produces a durable, uniform, high quality of finish, free from runs, sags or brush marks.

Grade Crossing Problem Discussed at Washington

AN INTENSIVE discussion of the grade crossing problem, which gives promise of some effective results, was the feature of a two days' conference held at Washington, D. C., on December 15 and 16. The meeting was attended by representatives of the railways, state highway and railway commissions and other interests vitally concerned in the subject, at the invitation of Secretary Hoover of the Department of Commerce. The transactions at this meeting consisted primarily of a discussion of reports presented by eight committees and the drafting of resolutions outlining the conclusions reached with respect to general principles to be observed in efforts to decrease the hazard at crossings of highways and railroads. Definite assurance of the continuation of the work of this council is indicated by the passage of a resolution providing for additional committee work and another conference in the course of a year. The recommendations adopted at this conference which apply to grade crossings are as follows:

Grade Crossings

Elimination of grade crossings, either by relocation of highways or rail lines or by grade separation, constitutes the only perfect solution of the grade crossing problem. It should be carried on under a proper program, first eliminating the most dangerous crossings on thoroughfares carrying heavy traffic. This is made difficult by the enormous costs involved, and, if attempted on a wholesale scale, would impose an excessive financial burden resting in the last analysis upon the public. It is, therefore, necessary that the program, having due regard to the relative costs and advantages of grade-crossing elimination and other methods of protection, be given the most thorough joint consideration by proper authorities. In laying out new highways the question of so locating them as to avoid railway grade crossings to the greatest possible extent should be carefully considered.

Relocation of highways offers many possibilities not yet fully developed which should be worked out by the state authorities, in co-operation with the railways. Authority to order grade sep-

arations or proper protection at grade crossings should be vested in the state commission having jurisdiction over the railways, which should also determine and enforce a proper division of the costs between the railroads and the public. The state highway department should have the authority to plan the improvements and to initiate the proceedings for all highways under its jurisdiction. Time is an essential element and a prompt decision should be provided for in the law.

Properly designated state commissions should be empowered to designate dangerous grade crossings at which motorists must stop.

The elimination and protection of grade crossings are of such importance and involve to such an extent the public safety as to require that priority be given to them, in the allocation of capital funds by the railroads, and of public moneys for highway building over expenditures for other safety measures designed to protect the public.

Railroad crossings remaining at grade should be safeguarded in every reasonable way. Standard warning signs and pavement markings should be used to mark the approach to all public railroad crossings. Where the volume of traffic requires it additional protection should be afforded by the use of flagmen, gate, or approved electric or mechanical devices.

Sharp curves, abrupt changes of grade, roughness in the pavement, or other conditions at or near the tracks which tend to divert the attention of the motorist should be avoided.

The spotting of cars near unprotected crossings by railroads should not be permitted.

Unless full-stop is required by law vehicles should not be permitted to exceed a speed of 15 miles per hour when approaching within 100 feet of any railroad crossing. There should be a penalty enforced against a motorist who disobeys a clearly visible and positive signal to stop at a grade crossing.

Railroads Confer Annual Track Awards

AS IN PAST years a number of railroads have conducted track inspections which form the basis for the award of prizes to supervisors and section foremen whose subdivisions or sections excelled in appearance, condition of maintenance, riding quality of track, etc. Following are reports of the awards of premiums on the Lehigh Valley; the Southern; the Norfolk & Western; the Delaware, Lackawanna & Western; the New York Central, Eastern lines; the Richmond, Fredericksburg & Potomac; the Pennsylvania, Central region; the Erie, Chicago region; the Pere Marquette and the Hocking Valley.

Norfolk & Western Awards

The results of the annual inspection of the Norfolk & Western showed that with two exceptions, all of the divisions scored higher average markings than in the previous year with the Eastern general division slightly higher than the Western. A total of 83 section foremen were awarded prizes. The list of the winners of first prize is as follows:

District No. 1, J. T. Goode, Norfolk, Va.
District No. 2, M. V. Smith, Suffolk, Va.
District No. 3, O. Mann, Farmville, Va.
District No. 4, J. W. Ransome, Lynchburg, Va.
District No. 5, J. F. Woodall, Rougemont, N. C.
District No. 6, J. V. Houser, Stanley, Va.
District No. 7, J. R. Wells, Solitude, Va.
District No. 8, J. H. English, Starkey, Va.
Roanoke Terminals, B. A. Lucado, Roanoke, Va.
District Nos. 9 and 9½, J. W. Coffman, Salem, Va.
District No. 10, J. I. Carper, Clark, Va.
District No. 10½, C. S. Bryant, Draper, Va.
District No. 11, J. V. Mattox, Bluefield, W. Va.
District No. 12, J. F. Rose, Iaeger, W. Va.
District No. 13, J H. Booth, War Eagle, W. Va.
District No. 14, A. C. Davis, Tazewell, Va.
District No. 15, B. Marcum, Wilsondale, W. Va.
District No. 16, Wm. Williamson, Nolan, W. Va.
District No. 17, John Shay, Lucasville, Ohio.
District No. 18, Wm. Fidler, Omega, Ohio.
District No. 19, A. McCann, Rarden, Ohio.

Results on the Lehigh Valley

The method used in the annual track inspection of the Lehigh Valley divides the maintenance work up into a number of classes with a definite number of points assigned to each class. Ratings on each class are made independently. The maximum points for each class are 35 for surface, 35 for line, and 6 each for ties, anti-creepers and joints, ballast, drainage and general appearance, or a total of 100. The results of the inspection gave the New York division, A. M. King, division engineer, the highest rating of 99.30, with the New Jersey & Lehigh, J. F. Donovan, division engineer, second with 98.85 and the Seneca division, G. A. Phillips, division engineer, third with 98.60. The results by sub-divisions gave J. Sheehan, supervisor on the New York division, the highest rating or 99.30; E. F. Dinan, supervisor, New Jersey & Lehigh, second with 98.99; and A. B. Shimer, supervisor, New Jersey & Lehigh, third with 98.91.

Hocking Valley Awards Track Prizes

The Hocking Valley held its thirtieth annual track inspection on November 10 and 11, following which it has awarded the first supervisor's prize to C. H. Ward, track supervisor at Logan, Ohio, the second prize to F. A. Sparks, supervisor at Marion, Ohio, and the third prize to L. J. Quinn, track supervisor, with headquarters also at Logan, Ohio. Among the section foremen, the first prize for district No. 1 was awarded to John Cook at Rising Sun, Ohio; for district No. 2 to Harry Harbury at Upper Sandusky, Ohio; for district No. 3 to Frank L. Quickle at South Columbus; for district No. 4 to Perry J. Pinney at Logan, Ohio, and for district No. 5 to Elmer Hixinbaugh at New Plymouth, Ohio.

Pere Marquette Announces Ratings

The Toledo-Ludington division received the highest rating with a grade of 88.19, this being the fourth successive year in which this division led the others. A prize of $100 for the best supervisors' district was awarded to William O'Brien, track supervisor on the Toledo division, with headquarters at Toledo, whose subdivision received the rating of 88.58. A rating of 90, given to this subdivision last year, was also effective in giving Mr. O'Brien the prize in 1923. M. Jorgensen, supervisor of the Muskegon division, with headquarters at Muskegon, Mich., was awarded a $100 prize for the subdivision showing the greatest improvement in rating compared with the rating given last year, or from 84.83 to 85.86, a change of 1.03 points. In addition to these awards, prizes of $25 each were given to 13 section foremen whose sections showed the highest average on each supervisors' subdivision, and to 12 section foremen whose sections manitested the greatest improvement for the year.

Motor Cars Awarded on Southern

The annual inspection of the Southern resulted in the Middle district receiving the highest rating (82.4) for roadway and the Eastern district, the highest for bridges and buildings (85.7). By divisions, the highest ratings for roadway were awarded to the Danville division, Northern district, 84.7 points and the Coster division, Middle district, second with 84.5; and for

bridges and buildings to the Spartanburg division, Eastern district, 87.0 while the Washington division, Northern district was second with 86.0. Prizes of motor cars and gold were awarded to the foremen on each supervisor's territory having the best section or securing the best results in the bridge and building department. If the first prize winner had a motor car, he received $20 in gold and the car went to the second best; if the second man had a motor car, he was awarded $10 in gold and the car assigned to the third man. A total of 48 motor cars were awarded in the roadway department and 12 in the bridge and building department, together with 66 prizes of $20 each and 63 of $10 each.

Awards on the Richmond, Fredericksburg & Potomac

Two sets of prizes were awarded following the annual track inspection of the Richmond, Fredericksburg & Potomac, one on the results of the marking of the judges by points and one on the basis of the lowest cost per mile per point of judges' rating. The first set of prizes were awarded to the following section foremen:

First prize $100, A. B. Cox.
Second prize, $80, J. W. Blanton.
Third prize, $60, J. S. Carpenter.
Fourth prize, $40, W. H. Sisson.

The second set was awarded to the following section foremen:

First prize, $100, M. B. Carter.
Second prize, $80, L. T. Surles.
Third prize, $60, J. W. Blanton.
Fourth prize, $40, W. H. Sisson.

Results on the Pennsylvania System—Central Region

The supervisors' prizes for the Central region of the Pennsylvania System were as follows: For the best line and surface maintained throughout the year in the region, F. L. Shea, supervisor, Pittsburgh division, Derry, Pa., $800, and W. R. Parvin, assistant supervisor (now supervisor at Youngwood), $400; for the best line and surface throughout the year on the Eastern division, G. W. Myers, supervisor, Alliance, Ohio, $600; and for the best line and surface throughout the year on the Panhandle division, J. C. Dayton, supervisor, Newcomerstown, Ohio, $600. Additional prizes of $100 each were awarded as follows.

C. G. Grove, supervisor, Buffalo division, Struthers, Pa.
J. T. Ridgley, supervisor, Allegheny division, Oil City, Pa.
W. G. Kemmerer, supervisor, Renovo division, Emporium, Pa.
C. B. Bush, supervisor, Pittsburgh division, South Fork, Pa.
W. P. Critchfield, supervisor, Conemaugh division, Blairsville, Pa.
J. L. Gressitt, supervisor, Monongahela division, West Brownsville Jct., Pa.
James Foley, supervisor, Wheeling division, Wheeling, W. Va.
W. H. Saltsman, supervisor, C. & P. division, Ravenna, Ohio.
S. C. Hofmeister, supervisor, E. & A. division, Jamestown, Pa.
M. J. Bray, supervisor, Akron division, Orrville, Ohio.

New York Central Results

The New York Central inspection and award of prizes followed the plan inaugurated during 1923. This plan divided the sections into classifications and groups, each group within each classification containing only sections of a similar character. Awards were in the forms of premiums added to the regular monthly compensation. The foremen who received the classification premium are: Classification 1, John Andros, sub-division 3, Eastern division: Classification 2, Emmanuel Teats, sub-division 27, Pennsylvania division; Classification 3, R. Claprod, sub-division 8, Adirondack division; Classification 4, Jos. Chubell, subdivision 13-a, Buffalo division and Classification 5, Angelo Pannazza, sub-division 13-a, Buffalo division.

The ratings of sub-division and divisions resulted in sub-division 13-b of the Buffalo division, of which J. P. Sexton is supervisor, receiving the highest rating, or 85.6. The second and third highest were respectively No. 10 of the Syracuse division, W. H. Skelton, supervisor, 84.8, and No. 5 of the Mohawk division, H. I. Hoag, supervisor, 84.1. The Buffalo division received the highest division rating with a grade of 84.5, the Syracuse division being second with 82.9.

Awards on the Delaware, Lackawanna & Western

The awards on the Lackawanna are made to section foremen, the winner of the first prize on each division receiving $100 in cash, a silver medal and a marker for his section; the second prize was $50 in cash and a silver medal. The efficiency men receive an efficiency sign, a marker for the section and $10 per month increased compensation and remain in this list as long as their sections are maintained to the same high standard.

The following is a list of the awards for the past season:

Morris & Essex division, east end: First prize, Jos. Venezia, Secaucus, N. J.; second prize, J. Phillips, Morristown, N. J.

Morris & Essex division, west end: Efficiency, Jos. Morgan, Johnsonburg, N. J., Eugene Morgan, Blairstown, N. J. and P. Tozzi, Portland, Pa.; first prize, M. Tozzi, Johnsonburg, N. J.; second prize, L. Disantis, Hackettstown, N. J.

Main line division, southern: Efficiency, W. Sutton, Mt. Pocono, Pa., and J. Kocella, Pocono Summit, Pa.; first prize, J. Langan, Tobyhanna, Pa.; second prize, J. McDonald, Elmhurst, Pa.

Main line division, northern: Efficiency, J. Fernan, New Milford, Pa.; first prize, A. Scott, Kingsley, Pa.; second prize, F. Brown, Foster, Pa.

Buffalo division, east end: Efficiency, J. Green, Savona, N. Y., and T. Carey, Painted Post, N. Y.; first prize, Jas. Romeo, Apalachin, N. Y.; second prize, A. Gliserene, Bath, N. Y.

Buffalo division, west end: Efficiency, J. C. Keating, Wallace, N. Y.; first prize, J. Morgan, Avoca, N. Y.; second prize, C. Velocci, Lancaster, N. Y.

Bloomsburg division: Efficiency, R. Shingler, Espy, Pa., D. Blizzard, Danville, Pa., and G. Thomas, Shickshinny, Pa.; first prize, L. Miller, Northumberland, Pa.; second prize, F. Pignono, Wyoming, Pa.

Syracuse division: First prize, F. Reitano, Tully, N. Y.; second prize, L. Warner, Chenango Forks, N. Y.

Utica division: Efficiency, John Moran, North Brookfield, N. Y.; first prize, W. Locantro, Sherburn, N. Y.; second prize, F. Julian, Waterville, N. Y.

Chicago Region of the Erie Awards Prizes

As a result of the annual inspection on the Chicago region of the Erie held in October, a first prize of $200 was awarded to C. Kier, track supervisor at Ashland, Ohio, whose subdivision received the highest rating in the region. A second prize of $100 was awarded to J. E. Fletcher, track supervisor at Decatur, Ind., for the subdivision with the second highest rating. In addition to awards to supervisors, the management awarded banner prizes of $150 to section foremen whose sections received the highest rating on each of the two operating divisions comprising the region, the prize winner on the Kent division being J. Stirp, and on the Marion division, W. F. Johnson. In addition to these prizes, eight $100 first prizes and the same number of $75 second prizes were awarded to section foremen whose sections received the highest and second highest ratings on each of the supervisor's districts.

How To Organize Track Maintenance For Highest Efficiency *

A Budget of the Year's Work Affords One of the Most Effective Means of Securing Economy

By I. H. Schram,
Regional Engineer, Erie, Chicago

THE foundation of any organization for maintenance of way work is the complete and careful programming of all parts of the work, particularly that of the section gangs, by whom most of the money is spent. This program should be translated into dollars, and put into the form of what most of us call a budget that gives a definite appropriation for the year. This appropriation should be set up well in advance so that the work can be prosecuted to the best advantage with respect to the season of the year and so that the force can be maintained on an adequate basis during the seasons when conditions are most favorable. This may mean that programs will have to be adjusted or restricted to fit estimated earnings, but a small program carried out consistently throughout the working season will give better results than a larger one rushed through late in the year with extra gangs too large and closely spaced for sufficient supervision. This also enables heavy renewals to be completed before the fall period of heavy freight movement, which should not be interfered with if it can be avoided, and need not be if maintenance work is carried on according to such a plan. Last year remarkable progress was made in this way on the Erie and where it was continued this year equally beneficial results were obtained.

Appropriation Allocated by Months

If the annual appropriation or budget is prepared and authorized early it can be divided between divisions and distributed by months according to the needs of the seasons. For instance, we plan to use 10 per cent of our appropriation in each of the working season months and 5 per cent in each of the winter months, with 7 or 8 per cent during the spring months to cover the period of gradually increasing forces. When appropriations are exceeded one month, expenditures must be correspondingly decreased during the following month. By giving out monthly statements of expenditures to each supervisor, he can readily handle his work so as to keep within his appropriation. The allotments for bridge and building and signal forces can be made by programs, but for track work they must be based on section characteristics. The equated mileage method developed by the American Railway Engineering Association will take care of this readily so that the section with the heaviest territory will receive the greatest appropriation, the element of judgment being necessary in selecting the factor by which the mileage on each section is multiplied to equitable distribution of the force throughout a division, that can be raised or lowered proportionately with variations in the budget allowance. The section that has the most work, as determined by the greatest mileage of tracks, number of switches or road crossings, or the largest program of tie renewals, ditching or track surfacing out of face is allotted the largest number of men. This insures fairness in assigning the force which promotes the best possible morale, and as our results are largely dependent on the efforts of our foremen, this is an important factor. The equation of tracks is also useful in awarding prizes to foremen for it is necessary, where this is done, to have conditions as nearly equal as possible.

With the force and program established in proper relation for each section, the work of the section can be carried through the season with a uniform force and at the proper time. With early spring cleaning, surfacing and tightening of bolts out of the way, an early start can be made on tie renewals, which are cleaned up before it is necessary to mow the right-of-way and grass the roadbed, after which plenty of time is left for the heavy surfacing and lining of the summer months.

Favors Employment of Local Labor

By thus organizing section work seasonably and employing a uniform and fair force it can be carried out economically and efficiently. In many localities local labor can be employed if an early start is made and the total force for the season will be less than if transient labor has to be recruited Ties are installed when the work can be done cheapest, surfacing when it can be made to stand up best and the track will be placed in best shape for fall and winter.

Material for section work must be furnished as required or the work of inserting it cannot be carried on efficiently. Except for the bulky and heavy materials, the distribution can no doubt be accomplished best by a supply train, whereby oil, tools and other supplies are furnished directly to the section from the cars in the quantities ordered by the foreman, and all broken and dull tools or surplus material picked up. This soon puts a stop to the hoarding of material and results in more efficient work because it insures that the gangs will have the proper tools and supplies at all times.

The organization of extra gang work is also greatly aided by the early approval of budgets, for the success of such work is dependent almost entirely on the maintenance of adequate supplies of materials. It also gives the stores and purchasing departments plenty of time to obtain the supplies so that a rail laying gang will not only have the rail but all the accessories, the lack of any one of which will tie up the job until it is secured and result in reduced productiveness while the gang is moved or diverted on other work. Ballast gangs, similarly, are dependent on the output and delivery of material from the stone quarry or gravel pit and it is necessary to assure a supply of such material at a rate sufficient to keep the gangs going or to regulate the force to the supply if the work is to be done efficiently.

Maintenance work also requires the co-operation of

*Abstracted from a paper presented before the Maintenance of Way Club of Chicago on December 9, 1924.

departments other than the store department and can be expedited if such co-operation can be planned in advance. For instance, in laying rail on a multiple-track line, the uninterrupted use of one track greatly facilitates the work and permits the use of machines such as locomotive cranes which release hand labor and greatly speed up the work. But whether or not such machines are available and whether the work is done with extra or bunched section gangs it should be organized so that the proper number of men assigned to each operation and enough supervision is provided to insure the men doing the work properly and without interfering with other operations, since delay in one operation slows up the entire work.

General surfacing on stone or other hard ballast is best done with power tampers, which give more uniform and better results, relieve hand labor from its more arduous task and are also more economical than hand labor. Care should be taken to have these machines in good condition before the outset of the working season and to place them in charge of competent operators who can make minor repairs. This assures continuous operation, without which there is little economy in machine work. The force will vary according to conditions and the number of ties to be renewed, but with a three-inch maximum life, a crew of 18 men for each four-tool machine should complete 500 ft. of track a day. Other raising work should be planned along the same lines, varying the force with conditions but in every case providing sufficient supervision.

Get the Most Out of Work Train Service

Work trains are essential to the proper conduct of maintenance work, but should be carefully handled and their work reduced to actual necessities, which requires:

1. A work order for each day's work in writing from the supervisor who will assign the proper force to handle the work.
2. The elimination of preliminary switching in yards by work trains and the assignment of tracks for company material in yards and outlying points from which work trains may start.
3. Competent work train crews, which should be assigned as required.
4. Proper and necessary equipment and machines to do work as expeditiously as possible.
5. Convenient tie-up points on the line should be selected to avoid long runs, even if an engine watchman is required.

Division engineers and supervisors should give personal attention to work train operation, making sure that work orders include sufficient work and that trains are not subject to undue delays, which should be taken up with the operating department promptly.

Organized Competition

Competition stirs most of us to greater efforts and can be obtained with a little effort and expense. A system of reports giving the results of maintenance work as regards both output and costs is a remarkable stimulant. For instance, a weekly report of the status of tie renewals, issued to every foreman, indicating the status on each section, followed by a statement of the man hours per tie installed, has greatly lowered costs. Similar statements regarding the performance of ballast gangs, rail laying operations, and tie tamper performance over the entire region, issued to each supervisor create a similar rivalry, and this coupled with a rigid adherence to standards insures lowered cost of operation and a quality of work in keeping with high standards.

The awarding of prizes to section foremen and to supervisors annually for good track is another method of creating interest and competition that brings excellent results. Surely, the foreman who receives a substantial prize check on Christmas day with a letter from the management in appreciation of his services, becomes a better and more loyal employe, who will work even harder the next year to improve his track.

Discussion

The discussion centered largely around the question of the best method of cost accounting and keeping time. In answer to questions, Mr. Schram outlined the method followed on the Erie, which road has abandoned the monthly or semi-monthly time book in favor of a daily time slip provided with blank spaces in which the foreman enters the time of each man for the day, as well as a statement of the work the gang was engaged in and the material used. The particular advantage for this method which he pointed out lies in the fact that it permits the time rolls to be compiled from day to day, instead of waiting for the time books to be sent in at the end of the semi-monthly period. As a result the office work can be conducted with a smaller clerical force and greater accuracy is assured since the foreman is required to make a distribution of the time daily, whereas in the semi-monthly time book he frequently delays making his entries and then attempts to supply the information from memory several days later. He explained also that the foreman is provided with a monthly time and material book which he retains for his own information.

This explanation brought forth a large number of questions, some doubt being expressed as to the accuracy of the method, but Mr. Schram pointed out that the daily time slip supplies exactly the same information as that covered by entries on the various pages of the time book, the only difference being that the information is available in the office on the day after the entry is made instead of waiting for the time book to be turned in at the end of the period.

Considerable interest was also taken in Mr. Schram's remarks with respect to the allotment of maintenance of way expenditures for a full year in advance, it being manifest that none of the other roads represented at the meeting followed this practice. Considerable discussion also centered around the essentials for successful work train operation, notably item No. 3: "Competent work train crews, which should be assigned as required," it being pointed out that the maintenance officers had to accept whatever crews were assigned to this work under seniority provisions. Mr. Schram explained that the Erie was governed by the same restrictions in this regard as other roads, but pointed out that full co-operation with the operating officers, particularly the trainmaster, should lead to the removal of any conductor who was obviously incompetent. In this connection, William Hogan (B. & O. C. T.) described briefly the use of two 35-hp. motor cars which are being employed in hauling of track materials, loaded on push cars for distribution to the various sections in the Chicago terminal area.

RAILWAY MILEAGE—The Bureau of Railway Economics has issue a revised compilation of railway mileage in the world, which shows the total railway mileage of America to be 371,741 miles, including 271,427 miles for the United States.

Railways Spent Large Sums In 1924 For Improvement Work

Indications Are That 1925 Program Will Surpass That of Any Previous Year in Magnitude

RAILWAY improvement work which was comparatively active in 1923 was continued at an accelerated pace during 1924. The prospects are that it will be continued with considerably greater activity in the year now opening. These statements are based upon statistics and other information published in the Annual Review number of the Railway Age for January 3, from which the following is abstracted:

Many improvements to both equipment and facilities were a direct reflection of the excellent recovery which the railways have made since the period of government control. These improvements were not confined to any one department but were of a widespread nature, affecting all branches of departments. The amount of first track built increased considerably over that of previous years, while that of second track remained at a fair level. Construction other than track, while including a variety of facilities such as terminals and yards, was devoted largely to such improvement projects as grade separation, bridge renewals and others of a similar character to permit of better and more efficient train operation. Canadian construction likewise continued actively during the past year. Freight car orders exceeded those for 1923, totalling 143,728 as compared with 94,471 for the previous year. Passenger car orders were 2,554, the largest since 1913. These orders also indicated a considerable increase in the use of rail motor cars.

More New Lines Constructed During 1924

During 1924, 578.95 miles of first track were built in the United States as compared with 427.27 in 1923. The first track built for years previous to this aggregated 324 miles in 1922, 475 in 1921 and 314 in 1920. The total mileage of first, second, third and other main tracks was slightly below that of 1923 but practically double that for each of the preceding years, reaching a total of 1,113.77 miles, of which 456.12, 51.22 and 25.88 represented second, third and other multiple tracks respectively. Second track built in 1923, 1922 and 1921 aggregated respectively 683.99, 195.97 and 143.07.

Canadian mileage of first track totaled 614.50 and of second track, 21.22 miles, all of the latter being built by the Canadian National. This road also completed 4.35 miles of second track in the United States. Of first track, 409.8 miles was built and put into operation by the Canadian Pacific in the province of Saskatchewan and represents largely the completion of a number of branch line extensions which this road has had under way for a number of years. There still remains a considerable amount of first track to be completed in Canada, both by the Canadian Pacific and the Canadian National.

Of the 543.75 miles of first track built in the United States, 258.3 miles was constructed and put into operation in the state of Florida and three-fourths of the remainder was built in approximately six other states. Of the 258.3 miles in Florida, 204 miles was built by the Florida, Western & Northern, and the remainder by the Florida East Coast and the Ft. Myers Southern. The first track projects in the other states are of a much smaller nature, the largest amount being 41.46 miles in Kentucky, all constructed by the Illinois Central. This road also has under construction a 166-mile line to serve as a cut-off between Edgewood, Ill., and Fulton, Ky. The third state in the list was Oregon, with 33.83 miles, practically all of which was the work of the Oregon Short Line, a road which has been fairly active in first track construction for several years and which has considerable additional work in progress. It now has a line under construction from Rogerson, Ida., to Wells, Nev., 95 miles and two other units in Idaho of 27.78 miles and 2.66 miles in length.

Second Track Construction was Confined to a Few States

The construction of second track was likewise confined to a relatively few states, with the major portion built by a small number of the larger systems. There were no outstanding large units built by any one road which compared with the 202 miles of the Atchison, Topeka & Santa Fe during 1923, although this road completed 103.92 miles in New Mexico and California, the largest amount completed by any one road during the year just passed. The nearest approach to this figure was 68.42 miles for the Atlantic Coast Line in the states of North Carolina, South Carolina and Georgia. Other roads which built considerable second and other main track were the Illinois Central, the Florida East Coast, the Pennsylvania and the New York Central.

Other Roadway Improvements

Other road improvements during the past year include a large number of projects and involved large expenditures, of which a considerable amount will be carried over into 1925. Terminal improvements, both engine and freight, were made on most of the roads, although projects of this nature were not as numerous as they were in the previous year. The work of the eastern roads included a greater proportion of such projects as extensions and improvements to freight terminals, sidings and yards, the work of the western roads being more general in nature and including a wide variety of improvements. Grade separation, along with some grade and line revision received increased attention during 1924, some of the roads expending large sums for this class of work. The most outstanding program of this nature was that of the Illinois Central with work totaling over $15,000,000 and involving changes at Chicago, Riverdale, Harvey and Champaign in Illinois, and at Central City, Ky., and Jackson, Miss. Bridge renewals and bridge strengthening was carried forward on a large scale by many roads and in conjunction with the grade separation projects formed a large proportion of the year's work.

The abandonment of uneconomic lines continued in 1924 and, so far as mileage abandoned and taken up

was concerned, increased considerably over the figures for 1923, being 437.50 miles for 1924 and 128.82 miles for 1923. However, the figures for miles abandoned and not taken up declined from 384.13 in 1923 to 255.11 in 1924, a figure far below that of the previous years. Much of the increase in mileage taken up can doubtlessly be attributed to a better realization of the economic position of the many small roads as well as of the branch lines of the larger roads and the impossibility of securing sufficient traffic to make them pay even operating expenses. Thus instead of attempts to sell them as possible operating units or as roads which might be rehabilitated and operated profitably, there has resulted the absolute junking of the roads in order to liquidate the property and secure much value from it as may remain. It is interesting to note that the junking of lines involving more than a few miles was not all on the part of the small short lines for some of the large railroads apparently found it of advantage to get rid of unprofitable branch lines or parts of branch lines varying in length up to 40 miles. Typical of this was the abandonment of approximately 52 miles by the Denver & Rio Grande Western in Colorado, about 46 miles by the Chicago, Rock Island & Pacific, chiefly in Oklahoma, 22 miles by the Pere Marquette in Michigan and 15 miles by the New York, New Haven & Hartford, chiefly in Connecticut. While not influencing or becoming a part of last year's statistics, a recent proposal of the Boston & Maine in regard to future abandonment of lines is of interest as it is indicative of the possible effect of motor truck and motor bus competition in exceedingly congested teritories. This road proposes to abandon approximately 1,000 miles of branch lines and, so far as it may be feasible, to substitute motor truck and motor bus service for the steam service now rendered.

Signal and Interlocking Construction Increases

Signal and interlocking construction during 1924 showed a healthy increase over that of the preceding year, especially in regard to the signal-track, automatic block signaling and power interlocking, although uncertainty regarding the requirements of the Interstate Commerce Commission for train control installations tended to curtail the expenditures for signaling. In spite of this condition more miles of signaling and more levers of interlocking were placed in service than in any previous year since 1919. During the year just closed automatic block signals were installed on 1,564 miles of single-track road, an increase of 436 miles over the figure for 1923. Signals were also installed on 764 miles of double-track lines as compared with 746 miles the year before. The construction of manual block signaling was practically limited to one road, the Rutland. This road also contemplates additional installations of manual block signals during the next year. The number of new interlocking plants constructed in the United States and Canada was practically the same for 1924 as for 1923, being 106 for the year just passed and 108 for 1923. These new plants involved 774 mechanical levers and 1,172 power levers or a combined total of 2,486 levers, exceeding by 455 the number installed during 1923. As the year closed, 478 miles of single track and 395 miles of double track signaling were under construction on 22 roads and over 1,214 miles of single track and 433 miles of double track signaling are contemplated for 1925.

Marked progress was made in the installation of train control equipment during 1924. Of the 47 roads on which the first order of the Interstate Commerce Commission requiring a complete engine division to be equipped is now effective, only four have not as yet announced their selection of the system or device. The three installations previously in service, i. e.: the Chicago & Eastern Illinois, the Chicago, Rock Island & Pacific and the Chesapeake & Ohio, have been continued in service without extension of roadside equipment. Three other roads have practically completed their wayside signal and control installations on a complete division but equipment for the full quota of locomotives has been delayed. At least 22 other roads have installed control apparatus on sections of 20 miles which are on the specified territories and have equipped a corresponding number of locomotives, while the commission has made interim inspections of five installations and several other roads are now ready for these inspections.

Locomotive and Car Orders

The locomotives ordered for service in the United States during 1924 totaled 1,413, as compared with 1,944 in 1923 and 2,600 in 1922. Since 1901 there have been but four years other than 1924 in which locomotive purchases in the United States have failed to exceed 1,500. Orders placed by railroads in Canada with Canadian builders totaled 71 as compared with 82 in 1923 and 68 in 1922. The National Railways of Mexico were heavy purchasers of equipment in the United States, this buying including 50 locomotives. Other export business totaled 92 locomotives. This number of locomotives built for service in the United States was 1,726 as compared with 3,362 in 1923. Freight car orders exceeded those in 1923, but were less than those of 1922, the number ordered during 1924 for service in the United States totalling 143,728 as compared with 94,471 for 1923. Canadian orders placed with Canadian builders totaled only 1,867 as compared with 8,685 in 1923. The National Railways of Mexico ordered 1,740 cars from builders in the United States in addition to which 2,277 cars were ordered for export. The freight car production for the past year was 113,761, a decrease from 1923, when the production was 175,748.

The orders placed for passenger train cars for service on the railways of the United States totaled 2,554 and represented the largest number since 1913. Orders for similar equipment for 1923 and 1922 were respectively 2,214 and 2,382. These orders did not include railmotor cars either of the gasoline, gas-electric, or electric storage battery type, the orders for this class of equipment amounting to 120 in 1924 as compared with 76 for 1923. Orders placed by Canadian roads with builders in Canada totaled 100 cars for 1924, and 263 for 1923. In addition to this Canadian roads purchased 10 rail motor cars. Production of passenger train cars for service in the United States totaled 2,150 as compared with 1,507 in 1923 and was the largest reported since 1914.

The Outlook For 1925 Is Optimistic

On the basis of advance information furnished by 32 railway systems having one-half of the mileage of the country, it is estimated that the total capital expenditures of all of the railways of the United States and Canada in 1925 will be 15 per cent greater than in either 1923 or 1924. The information available indicates probable capital expenditures in these two countries in 1925 exceeding $1,350,000,000. Of these expenditures approximately two-thirds will go for roadway improvements as compared with 50 per cent in 1924

and 36 per cent in 1923. The expenditures planned by some of the roads are as follows:

Pennsylvania	$60,000,000
Southern Pacific (Pacific System)	52,000,000
Southern Pacific (Texas & Louisiana Lines)	10,600,000
Illinois Central	42,200,000
Missouri Pacific	26,200,000
Louisville & Nashville	20,000,000
Chicago, Rock Island & Pacific	17,000,000
Norfolk & Western	16,000,000
Reading	15,200,000
Central R. R. of New Jersey	14,500,000
Great Northern	13,000,000
Central of Georgia	9,700,000

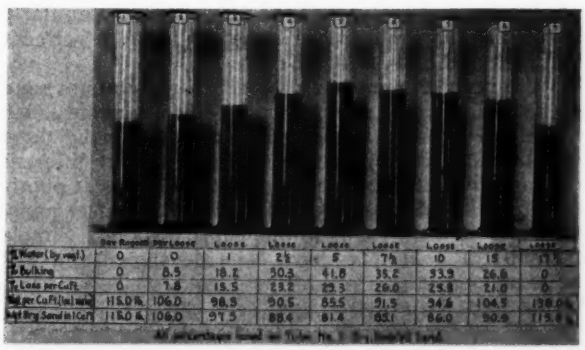
The New York Central does not prepare a budget but has carried over approximately $11,000,000 of unfinished work. The Santa Fe has not made its budget public but has carried over from last year's appropriations about $20,000,000 of unfinished work. While a large part of these expenditures have for their object the increasing of capacity a growing proportion is going for those improvements which have for their objective a reduction in costs of operation.

Among the more important extensions now under way or under consideration are the construction of 172 miles of new lines by the Southern Pacific in Arizona and New Mexico, and a 165 mile line which the Illinois Central has just started between Edgewood, Ill., and Fulton, Ky. More than $50,000,000 will be spent for second and other multiple main tracks on the Rock Island, the Florida East Coast, the Atlantic Coast Line, the Norfolk & Western and other roads. Eighteen roads reported that they will spend approximately $16,000,000 for the improvement of their classification facilities while 17 roads contemplate the expenditure of over $10,600,000 for shop facilities.

Moisture in Sands Affects Proportions in Concrete Mixtures

By R. R. Litehiser
Railways' Bureau, Portland Cement Association, Chicago

THE OBJECT of proportioning water, cement and fine and coarse aggregate in a concrete mixture is to place in it definite amounts of each. Extensive laboratory research has established that definite proportions of all these ingredients (including the water) are fundamental to uniform quality



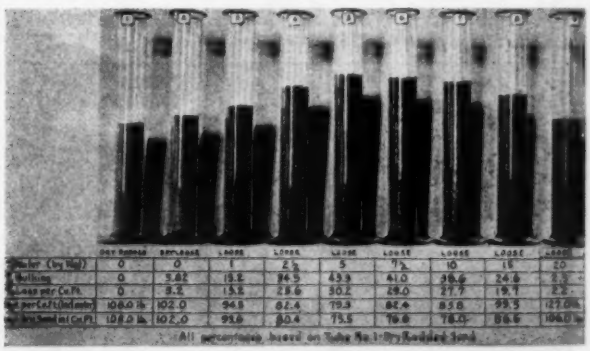
The Effect of Moisture on Coarse Sand, 0 to No. 4

and strength in concrete. To obtain accurate, truly comparable results in these laboratory tests, aggregates must be measured "dry and rodded" because in this condition a cubic foot of an aggregate has a practically constant weight, and the proportions in which the aggreates are measured "dry and rodded" will insure definite amounts of each in the mixture. Furthermore, since the tests have been made in this manner, it is necessary that the results obtained must be presented in tables showing the proportions in terms of "dry and rodded" aggregates.

On the other hand, aggregates in the field are necessarily piled loose and are usually damp and at times, wet. Therefore, it is common practice to measure the agregates damp and loose from the piles. Most engineers, inspectors and foremen on concrete work have observed that moisture in sand caused it to bulk or increase in volume, while it has practically no effect on the volume of coarse aggregate. At the same time it has no doubt been observed that proportions which gave concrete of the desired workability one day with one lot of aggregates, gave concrete that was harsh and difficult to handle on another day. It is not uncommon to lay the trouble to the moisture in the sand but the magnitude of the effect of the moisture is by no means generally understood.

Tests Bring Out Remarkable Differences

The effect of different quantities of water on the volume of the sand was brought out in a most striking manner by an experiment. In order that the experiment might be sufficiently general, three sands were used, viz., a coarse sand graded from 0 to ¼ in. and designated as O-No. 4, a medium sand graded from 0 to ⅛ in. and designated as O-No. 8, and a fine sand graded from 0 to 1-48 in. and designated as O-No. 48.



The Effect of Moisture on Medium Sand, 0 to No. 4

Each was thoroughly dried before the experiment began and varying amounts of moisture added to successive samples of equal weight of each sand. These samples were then placed in glass hydrometer jars as shown in the photographs which illustrate the effect of moisture and loose measurement on coarse, medium and fine sand respectively. The procedure in showing the effect of moisture in each grading of sand is ex

plained in the following paragraphs in order that the sand. As previously mentioned, a given weight of an aggregate in a "dry, rodded" condition occupies a practically constant volume. One of the samples was accordingly "dry, rodded" into Jar No. 1 to establish photographs may be clearly understood.

Nine samples of equal weight were taken from each a definite standard with which to compare volumes of the same weight of sand in the other jars. This sample was placed in Jar No. 1 in three approximately equal layers, each layer being tamped 30 times with a ¼-in. rod and the top of the sand leveled off. Another sample of dry sand was then placed, a scoopfull at a time, in Jar No. 2. This jar then contained dry, loose sand, which accordingly occupied a slightly greater volume than the "dry, rodded" sand in Jar No. 1.

Jars 3 to 8 inclusive, were filled with samples of sand to which had been added 1, 2½, 5, 7½, 10 and 15 per cent of moisture (by weight of dry sand). Jar No. 9 was filled with sand containing slightly more moisture than was required for saturation. This amount varied for the three grades of sand.

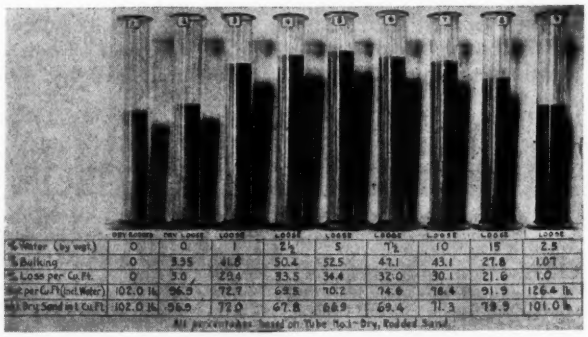
Moisture Causes Sand to Bulk

It will be noted that up to five per cent of moisture the sands continued to increase in volume. This increase in volume amounted to 40 per cent of the "dry, rodded" volume of the coarse sand and to 52 per cent of the "dry, rodded" volume of the fine sand. Beyond this there was a gradual decline until at saturation the volume was nearly the same as that in a "dry, rodded" condition.

In order that differences in volume might be distinctly evident, jars whose height were several times their diameters were used. This resulted in a comparatively large glass area for the volume of sand and as the sands became successively wetter, there was a greater tendency for the sand to stick to the glass and not settle as much as it would under conditions of field measurement. A comparison of the bulking due to moisture as measured in these tests with that measured in a cylindrical measure whose height is approximately equal to its diameter, shows the former to be approximately 10 per cent higher. Therefore, the tests in the glass jars exaggerate the true condition by that amount.

The important lesson to be gained from the photos is that the actual amount of sand in a cubic foot of damp sand measured loose varies within wide limits. Using the values from the case of the coarse sand for illustration, it will be seen that while one cubic foot of sand in a "dry, rodded" condition weighs 115 lb., the weight of dry sand in one cubic foot measured loose and containing five per cent of moisture is but 81.4 lb. Thus, 33.6 lb. or 29.3 per cent of the sand was lost by measuring it damp and loose. Field tests show that a moisture content of five per cent in sand is quite common.

But entirely aside from any comparison with "dry and rodded" sand we find that a cubic foot of



% Water (by wgt.)	0	0	1	2½	5	7½	10	15	25
% Bulking	0	33.5	41.8	50.4	52.5	47.1	43.1	27.8	1.07
Lbs. Loss per Cu. Ft.	0	33.6	29.4	33.5	34.4	32.0	30.1	21.6	1.0
Lbs. per Cu. Ft. (incl. Water)	102.0 lb.	96.9	72.7	68.5	70.2	74.0	76.4	91.9	126.4 lb.
Lbs. Dry Sand in 1 Cu. Ft.	102.0 lb.	96.9	72.0	67.8	68.9	69.4	71.3	78.9	101.0 lb.

All percentages based on Tube No. 1—Dry, Rodded Sand.

The Effect of Moisture on Fine Sand, 0 to No. 48

coarse dry sand measured loose weighs 106 lb. or 24.6 lb. more than the dry sand in a cubic foot measured loose with five per cent of moisture. Therefore, in proportioning loose coarse sand by volume it is possible to have a variation of as much as 23 per cent in the amount of actual sand in the mixture, depending on the amount of moisture it contains. Similarly in the medium sand the variation would be 26 per cent and in the fine sand 31 per cent.

With such differences in the actual amounts of sand going into what is assumed to be fixed mixtures such as 1-2-4, 1-3-6, etc., it is easy to understand why there will be a difference in the concrete mixed on different days or with different consignments of sand. It points clearly to the necessity of taking the content of moisture into account in determining proportions. Simple methods of doing this have been developed and will be explained later.

A Tonnage Train on the Big Four

Delivering Material Direct to Bridge Reduces Renewal Cost

Midland Valley Plans for Buying Creosoted Timbers Insures Separate Shipment to Each Structure

ABOUT three years ago the Midland Valley railroad a line 365 miles long, extending from Fort Smith, Ark., across the northeast corner of Oklahoma, to Wichita, Kan., adopted a creosoted timber ballasted structure as the standard for the renewal of its pile trestles. As this road did not have its own timber treating plant the change immediately introduced the problem of the expeditious delivery of the piles and timbers from a commercial plant. It had been the practice in the construction of trestles of untreated timber to order the material from the mills without any consideration of the particular structure in which it was to be used, and to receive this material in central yards from which it was later shipped to the individual structures as the work of the field forces progressed. This plan did not meet the needs of creosoted timber construction because at least a portion of the timber had to be ordered for particular structures to permit it to be framed to dimensions before treatment if the benefit of the treatment was to be realized. There was also the obvious waste of the duplicate handling involved in unloading the material in a store yard and then reloading it for delivery to the bridges.

The obvious alternative was to have the materials delivered direct from the timber treating plant to the bridge but this suggestion immediately gave rise to numerous objections. It implied the accurate billing of the material for each bridge months in advance. It involved the question of possible delays to gangs because of the non-delivery of materials to the bridges on which it might be most convenient for them to work at a particular time. It was objected to also as resulting in the wasteful use of cars for the long haul from the treating plant to the bridge because less than a carload of either piles or timbers was frequently required for certain bridges. However, all these objections were overcome through the developmnt of a comprehensive plan embracing the entire process of authorizing the renewals, ordering the material and directing the work of construction under a system that not only provided for the delivery of the material to the individual bridges but which also set up a definite relation between the delivery schedule and the schedule for the starting and completing of the construction work on each bridge.

Inspection Report Forms the Basis

The first requirement of the plan was the preparation of a bridge inspection report form to be filled out complete for each bridge each year. The bound volume of these inspection reports, together with a bridge book giving the ravine sections of all trestles on the line, the record of pile penetration at each bent, and other important information, forms the basis on which the bridge renewal budget is founded. As soon as possible after the general inspection of bridges is completed each fall a tentative work sheet is prepared, listing all structures that are considered as requiring either renewal or heavy repairs in order that conclusions may be reached as to whether they shall be renewed, repaired or replaced with masonry culverts or other types of structures. To this end it provides comparisons of the cost of such structures with the cost of creosoted timber bridges. This work sheet also shows the estimated time that it will take one of the regular bridge gangs to complete the work, including the time necessary to move from the previous job.

This work sheet enables the officer in responsible charge to obtain a comprehensive idea of the tentative program of the work for the year, covering such features as the character and amount of work, the total estimated cost and the proposed work schedule for each of the bridge gangs, these schedules having been laid out so as to reduce the non-productive time to a minimum. With this sheet as a basis the necessary authority is issued for the work to be done and a bill of material is made for each structure, with the piling and timbers segregated. Under this system this bill of material is prepared well in advance of the period that it will be required and the order is placed with the treating plant in ample season to enable it to perfect favorable purchasing arrangements and to afford adequate time for seasoning and the most economical conduct of the treatment. It also insures that the treating plant will be able to meet the schedule for the shipment of the material to the different bridges.

Order Sheet Gives Complete Information

As shown on the specimen items from the order sheet sent to the treating plant, the season's order for material is divided into individual items for each bridge, showing the destination, the date to be shipped, the routing, the items of material and the bridge number. It also provides blank spaces for the car number, the date shipped and the date unloaded. In case the material for one bridge does not make up a full carload, the order for two or three structures is assembled under one unit, with the notation "put in distinguishing strip" appearing between the items for the different bridges. In general instructions to the creosoting plant these distinguishing strips are designated as "short lengths of number eight wire placed

Specimen Items from the Material Order

Route via Kansas City Southern. Bill to Williams, Oklahoma. Ship June 10th.
No. 4 Car to contain:
On bed of car:
28 pcs. 12x14-14 2688 BM For Bridge 43.4
Put in distinguishing strip and load:

8 pcs.	12x14-16	1792 BM	For Bridge 21.7
56 pcs.	8x16-14	8363 BM	
7 pcs.	6x8-26	728 BM	
2 pcs.	6x12-22	264 BM	
2 pcs.	6x12-24	288 BM	
4 pcs.	6x12-26	624 BM	
12 pcs.	3x10-18	540 BM	
4 pcs.	4x4-16	85 BM	
21 pcs.	2x6-14	294 BM	

Car No..... Date shipped..... Date unloaded.....
Route via Kansas City Southern. Bill to Muskogee, Oklahoma. Ship August 10th.
No. 27. Car to contain:
25 piles 26 ft. long
15 piles 34 ft. long } For Bridge 298.5
Car No..... Date shipped..... Date unloaded.....

over the tops of the piles or bridge timbers and stapled," thus effectively separating material required for one bridge from that for another. In listing the materials for these combined loads care is taken to insure that the material loaded last will be for the bridge at which the car will arrive first, to insure that the material on the car will not be re-handled in unloading it at each structure.

In addition to the itemized order for material, the treating plant is furnished with blueprints showing the details of the framing, sizing and boring of all timbers on which this work may be done before treatment.

In addition to sending a copy of the material order to the treating plant, copies are supplied to all officers of the railway who are directly concerned with the work. As the material is loaded out the treating company advises the car number and the date shipped and this information is then transmitted to those having copies of the order, who enter this information in the designated blanks. This arrangement insures the close co-ordination between the delivery of the material and the construction work on the bridge. As a result it has been found possible to have the pile driver crews ready to start driving very shortly after the arrival of the piles, to have the decking and other timbers delivered about the time that the piles are driven and to have the bridge gang ready to install the deck shortly after the timbers were received.

Work Is Definitely Scheduled

The plan has been worked out so completely that it has been possible to schedule the work of the bridge gangs with a high degree of accuracy, three gangs being regularly employed. However, the schedule allows for the delays which may normally be anticipated and the plan has been further extended by granting the bridge foremen a reward in the form of a bonus for more rapid progress than that outlined in the schedule.

The work carried out under this plan during the season of 1923 entailed the use of 39,200 lin. ft. of piling and 675,000 ft. b.m. of treated bridge timbers. It was necessary to order some additional material during the year to take care of emergencies in the form of washouts as a consequence of several floods, but, in general, the schedule for the season's work was not varied from more than five per cent. The plan has made it possible to reduce the stored stock of bridge material to 25,000 ft. b.m. of treated timber and 2500 lin. ft. of piling, this being deemed adequate to take care of emergencies, ma-

MIDLAND VALLEY RAILROAD COMPANY SHEET NO._____

INSPECTION OF BRIDGES AND CULVERTS DATE MADE_____

BRIDGE NUMBER_____ OR CULVERT MILE POST_____

NOTE—Report each trestle approach and each steel bridge on separate sheets

TRESTLES GENERAL DESCRIPTION

Number and Kind of Bents	Kind of timber (Treated or Untreated)		Number of Panels	Number of piles or posts per Bent	Length of Panel or Span	Maximum Height	When Last Built	Number of Stringers in cord	Date necessary to renew	Average Penetration of Piles
	Piles or Posts	Deck								

STEEL BRIDGES GENERAL DESCRIPTION WHEN BUILT_____

TYPE	Number of Spans	Length of Spans	Date last Painted	Brand of Paint Used	Date necessary to re- paint	Condition of Span ties	Date Necessary to renew Span ties	Kind of Masonry	What masonry is founded on	Dimensions of Bearing Plates	Condition of Steel

CULVERT GENERAL DESCRIPTION WHEN BUILT_____

KIND	Height of Opening	Width of Opening	Length on Floor Line	Diameter of Pipe	Kind of Pipe	Distance top of Culvert to Base of Tie	Condition	

REPAIRS NEEDED — TO STEEL SPANS_____ SPAN TIES_____ AND CULVERTS_____

Description of Work	Material Required

Estimated cost to repair.....

Estimated cost to renew.....

Estimated Time required to re-drive.....

Estimated Time required to re-deck.....

Estimated Time required to repair.....

Inspected by.....

Present.....

Form Used for Reporting Bridge Inspections

terial salvaged from washouts being stored for further use as the opportunity affords. The same plan was pursued during the past year.

A Uniform Renewal Program

One circumstance which has been an important factor, contributing to the success of this plan is the fact that the Midland Valley has long followed the policy of arranging its bridge renewal program so that approximately the same average amount of trestle bridge work is renewed each year, representing approximately one-eighth of all the structures on the line. As a considerable portion of these structures is now being renewed by permanent bridge, the total number of temporary bridges is gradually being reduced, having been decreased from 49,000 ft. of structure in 1912 to 26,000 ft. in 1922.

We are indebted for the above information to A. W. Lefeber, vice-president of the Midland Valley, Muskogee, Okla. During the two years this plan has been in effect the creosoted timbers and piles have been purchased from the International Creosoting & Construction Company, Galveston, Tex., with which company the direct delivery plan is being carried out.

Petroleum Treated Ties Show Long Life in Hungary

By C. M. Taylor

Superintendent, Port Reading Creosoting Plant, Central of New Jersey and Reading, Port Reading, N. J.

IN AN earlier article, in *Railway Engineering and Maintenance* for April, 1923, page 159, describing the development of the preservative treatment of cross ties with petroleum creosote mixtures, I relied on American precedents and practices for the necessary evidence that the use of such a mixture was both practical and safe. Since that time much interest has been shown by various railroads in the problem and some are using petroleum-creosote mixtures for the treatment, while others are making investigations with the idea of adopting it as standard practice.

At the time when the more general use of petroleum-creosote mixtures was proposed, the price of creosote ranged between 16 and 20 cents per gallon. Some people thought that the main reason that mixtures were being proposed was to lower the price of creosote by lessening the demand. The facts are that even though the price of creosote oil continues to drop, the addition of petroleum to creosote for tie treatment will increase and the results will be much better than if creosote oil had been used alone in treating the cross ties.

Similar Practice in Europe

However good American practice and precedents have been, it is gratifying to learn of some independent European results along similar lines. In the same year (1902) that the Santa Fe installed some petroleum treated ties in test tracks in Texas, a Hungarian named Polifka was instrumental in having a large number of beech and white oak ties treated with a petroleum mixture far more radical in its formula than any yet practiced in this country, his mixture consisting of 90 per cent Roumanian petroleum and 10 per cent of beech wood tar creosote, with about 13 per cent acid content.

The records compiled by the State Railways show that the ties in the first section are standard European main line beech ties 2.7 metres (8 ft. 9 in.) long, treated in 1902 and laid in 1903. A total of 1,264 ties were laid in this section, which is stone ballasted, tie plated and in every respect a typical main line of the Hungarian railways, carrying a dense traffic. The renewal record is as follows:

Removed in 1922	3 ties
Removed in 1923	6 ties
Total renewals	9 ties
Per cent renewals	Less than 1 per cent

The second installation was made about three miles beyond the first. In this section were placed 3,512 beech ties, treated in 1902 with the same mixture and laid in 1903. This section is on gravel ballast with tie plates 6⅜ in. by 8½ in. A total of 43 ties have been removed from this track to date as follows:

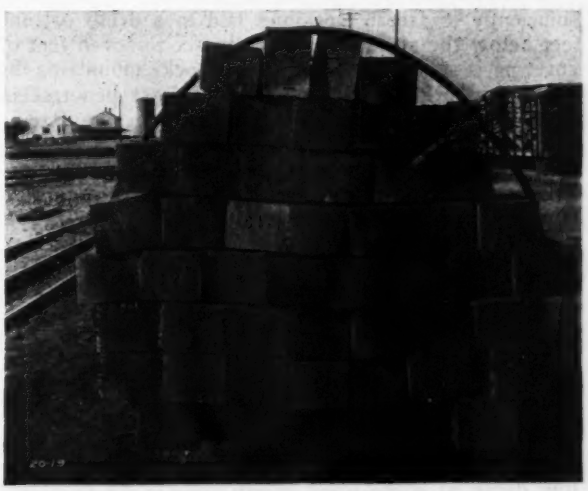
Removed in 1909	1 tie
" " 1920	38 ties
" " 1922	2 ties
" " 1923	2 ties
Total	43 ties or 1.25 per cent.

The third section is located about a mile beyond the second where 1,300 white oak ties were laid on a rather sharp curve carrying the bulk of traffic into Szolnok, which is a large railroad center, seven different lines connecting there with a big freight classification yard including a hump. Of these 1,300 ties, the removals to 1924, were as follows:

Removed in 1920	37 ties
" " 1921	102 ties
" " 1922	17 ties
" " 1923	11 ties
Total	167 or about 14 per cent.

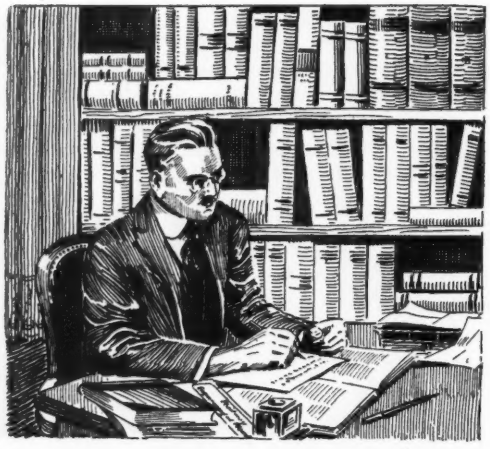
This track has been rebuilt and more mechanical wear took place than ordinarily. Also in the rebuilding any tie which was not almost perfect was thrown out and used elsewhere, but no record was kept of such reused ties, so that while 14 per cent were removed from the main line curve, undoubtedly some of these were used elsewhere.

It should be remembered that the beech of Hungary has practically no heartwood, so that the penetration of the treatment was almost perfect. This has been clearly shown in sections sawed from specimens of these ties taken from the track.



A Tram of Sawed Douglas Fir Crossties Ready for the Treating Retort. Note the Identifying Brands on the Exposed Ends

What's the Answer?



This department is designed to serve as a reader's service bureau, wherein the many problems which arise in the routine maintenance of tracks, bridges, buildings and water service facilities, may be subjected to frank and thorough discussion. The value of the service thus rendered is proportionate to the extent to which readers avail themselves of it, in submitting questions and in lending their co-operation by offering answers to the questions presented.

Questions to Be Answered in the March Issue

(1) *What measures should be taken to maintain the gage at railway crossings?*

(2) *Is there a danger of underground pipe lines which have given no trouble during the winter freezing during sudden thaws? If so, what is the explanation and what precautions should be taken to prevent the trouble?*

(3) *To what extent should track foremen make a record of those portions of their track which have heaved during the winter so that proper remedial measures may be taken next spring?*

(4) *Creosoted ballast trestle decks are formed either by a close placing of stringers or by supporting a plank floor on stringers placed some distance apart. What are the relative merits of these two forms of construction, aside from considerations of first cost?*

(5) *What inducements can a section foreman offer young men in his community to enter track work?*

(6) *What method of roof drainage is recommended for northern climates to insure that gutters will not be clogged with ice when the roof snow is melting?*

(7) *When should track forces begin to pick up dirt ballasted track in the spring? What is the danger, if any, to beginning too early?*

(8) *What are the requirements of a pile follower and what precautions are necessary in driving to prevent shattering the tops of concrete piles?*

Winter Protection of Pipe Lines

What are the relative merits of the different methods of keeping underground pipe lines from freezing?

The Use of Cinder Back Filling Is Bad

By Edwin M. Grime

Supervisor of Bridges and Buildings, Northern Pacific, Fargo, N. D.

In the northwest frost has been known to penetrate sufficiently to freeze pipe lines laid to a depth of nine feet below the surface but usually six to seven feet of covering is sufficient. West of the Rocky mountains the climate is milder and the depth of frost penetration decreases to three and four feet and on the Pacific coast, where some pipe lines may be seen above the surface of the ground, even less covering is used.

Frost will penetrate much deeper where the ground is moist or wet than where it is dry and a loose gravel soil will not offer the same resistance to frost as a dry, well compacted soil. There is a marked difference in the depth that frost can penetrate when there is an accumulation of snow on the ground early in the winter or before freezing weather. A covering of 12 to 18 in. of snow in the early winter has entirely prevented the freezing of the ground throughout the winter. On the other hand, pipe lines covered with six feet of earth have frozen where there was no snow on the ground. If a pipe line is known to lay at a shallow depth at some point it can usually be protected satisfactorily by covering the ground with a foot of manure or straw held in place with a few boards, earth or other material. Sometimes a permanent mound of earth of the proper depth for full protection may be built over the line.

Where there is liability of freezing, care should be taken when back filling the trench to see that dry loam is used as far as practicable and that it is thoroughly tamped into place so as to become a good insulator and also to exclude the moisture. Cinders should never be used for back filling on account of their porous nature and the possibility of moisture leaking through, forming sulphuric acid and corroding the pipe. Coarse gravel should be mixed with finer material and tamped well to avoid the possibility of voids which might permit the frost to penetrate. In some extreme conditions a small continuous flow of water through the line may be advisable during extremely cold spells but this is a wasteful practice and should be permitted only as a last resort.

Sinking Below Frost Line Only Sure Preventive

By F. B. Tapley

Engineer Maintenance of Way, Canadian National, Edmonton, Alta.

Obviously the best and surest method of protecting underground water pipes from freezing is to place them below the frost line. The depth will vary with the locality, minimum winter temperature and the height of the water table. I have known of small water pipes freezing solid at a depth of seven feet in the eastern provinces in winters when severe frosts occurred and the snowfall was light. In the west eight feet is considered a safe depth for water pipes laid in the outlying

districts, where appliances for thawing are not readily available. This depth presupposes a freezing to six feet below the surface. In southwestern Ontario pipes may be laid from three to four feet in depth without danger of freezing as the frosts are not severe as a rule nor the cold snaps of long duration.

There are other methods for the protection of water pipes, where local conditions practically forbid deep trenching, but none of them are permanent as to the character of the work and all will at some time or another become a source of anxiety to the man in charge. Wooden boxes with single or double air spaces surrounding the pipe will be effective for some years, but as the wood rots and the moisture enters their effectiveness is greatly reduced. Dry sawdust is another agent of prevention and so are dry buckwheat hulls; but these have generally to be encased in some manner to prevent absorption of moisture from the ground. Fresh manure, dry sawdust, sand and gravel are good when placed around standpipe vaults and hydrants, if boxed on the sides to prevent them from becoming scattered by traffic or the wind. An economy heater or a lantern will often prevent freezing in shallow standpipe pits or hydrant vaults if placed there on cold nights.

Our experience led us some years ago to increase the depth of the vaults of standpipes from six feet to seven feet six inches, using a single or double air space deck, made on one inch boards with 2 in. by 3 in. or 2 in. by 4 in. pieces for spacers. A vault of this type will stand temperatures of 30 deg. below zero without freezing the valves, and a lighted lantern or oil heater of the economy pattern lowered into the vault on very cold nights will make this doubly sure.

After all, the placing of water pipes is a matter of economics. All things being equal the pipes should be placed at a depth below which the ground in the particular locality will not freeze. If the cost of trenching is likely to prove prohibitive to obtain the desired depth of a shallow trench should be supplemented by insulation by using either dead air or some other type of protection.

Where a sure supply of water is necessary at all times, as at an important terminal, untried methods should not be tolerated. Cast iron pipe is expensive and costs money to lay. If properly laid at a depth below all possibility of freezing it will give no trouble for many years. To lay such expensive material at a shallow depth is waste, for it costs money to dig it up, thaw it out, and in the end relay it at a safe depth.

Separate Gangs for Painting

Should bridge and building painting be done by separate gangs?

One Gang Should Do Both

By J. P. Wood

Supervisor, Bridges and Buildings, Pere Marquette, Saginaw, Mich.

Local conditions govern to a great extent the use of separate gangs for the painting of bridges and buildings but, as a general practice, one gang should do both. There is only a small portion of the country where it is practicable to do bridge painting during the winter months and if one gang does nothing but bridge painting the force must be laid off when cold weather comes. By spring time most of the men have found work elsewhere, thus necessitating the organizing of a crew of inexperienced men. Where one gang paints both bridges and buildings, it can be employed during the winter months on the interiors of buildings, thus giving the men employment during the entire year, and thereby retaining many of the same men for years. The longer men stay in the service the more proficient they become, thus reducing the cost of operation. Also, if the work is divided two full sets of equipment must be provided and maintained at a cost of approximately twice that which is necessary for one gang.

In addition, one gang can start in at one end of a division and do both classes of work as they come to it, thereby eliminating one-half of the transportation charges that would accrue if two gangs were employed.

Bridge Painting Done Better by Bridge Crews

By E. L. Sinclair

Assistant Engineer, Chicago, Milwaukee & St. Paul, Marion, Ia.

If a large amount of building painting is scheduled for a season, it is best to organize a painting crew in charge of an experienced foreman who really knows how to do good building work. For bridge painting the work can be handled successfully by a bridge crew for a large part of the work and the most important part consists of the cleaning of the steel before the paint is applied. This can be done as well and often better by bridge men than by painters. If only a few small bridges are to be painted the bridge crews can often do the bridge painting in connection with other bridge work in the same locality as they are already organized and have the equipment for staging.

Keeping Cinders From Freezing

What measures may be adopted to prevent cinders from freezing in cars while being handled to the point of unloading?

Salt on Car Bottoms Will Help

By L. Coffel

Supervisor, Chicago & Eastern Illinois, Momence, Ill.

The handling of cinders in either center dump or hopper bottom cars should be stopped when freezing weather approaches. During cold weather cinders should be loaded from either dry pits or sump pits, as far as can be done, with a locomotive crane and clam shell bucket into flat bottom cars. The bottoms of the cars should be given a generous coating of strong salt brine or rock salt should be sprinkled over the bottoms before loading. This will be found to keep the cinders next to the car floor loose for several days.

Keep the Cinder Cars Moving and Unload Promptly

By H. C. Murphy

District Engineer, Chicago, Burlington & Quincy, Galesburg, Ill.

The best way to prevent cinders from freezing in cars is to unload them as promptly as possible after they are loaded at the pit. If there is no need for them in the immediate vicinity of the terminal so that they can be unloaded before they freeze, they should be unloaded in storage. With an up-to-date caterpillar clam shell, a 1½ yd. bucket for unloading the cinders, they may be unloaded and loaded up again for probably not to exceed 15 cents per yd. Also, when the cinders are taken from storage they may be loaded in H. & B. cars, which permits of unloading them with a Lidgerwood outfit and plow and thus, a big saving is effected over unloading by hand.

The usual way to unload frozen cinders is with men,

picks and bars. This usually takes at least four times the labor of unloading loose cinders and runs the train service into punitive overtime. I know of one case where in emergency it was necessary to raise a sag out of a yard during winter months. The cinders used were stoker made and thoroughly saturated when loaded. They were frozen almost solid when received. Steam lines were run from a switch engine and at the extremities of these lines, pipe nozzles were attached. These were forced down into the cinders and the cars gradually thawed out. It has been suggested that a long enclosed heated shed to accommodate 10 to 15 cars be built and that cars be thawed out before unloading. This, however, would not prevent their freezing again while in transit.

Usually, however, the most economical way of meeting the problem is by cinder storage, unloading by clam shell or from a temporary trestle and reloading again by a caterpillar dragline in H. & B. cars. My estimate of the actual cost of unloading cinders, not including transportation costs, is as follows:

10 cents per yard under ordinary circumstances.
40 to 75 cents per yard frozen.
25 cents per yard—storage and distributing from H. & B. cars.

Lighting Tunnels

What is the best way of lighting tunnels to facilitate the work of track and other maintenance forces?

Acetylene Torches on Push Cars Useful

By L. B. Allen
Superintendent Maintenance of Way, Chesapeake & Ohio, Richmond, Va.

Where traffic in tunnels can be regulated and controlled during the period of work, the most satisfactory light is a large acetylene or carbide torch, located on a push car at an elevation sufficient to allow the light to shine down on the point of work, using one or more torches at each end of the work and moving them along with it.

Where traffic cannot be controlled, and truck cars cannot be used in the tunnel, it is unsatisfactory to attempt to use carbide torches located in the side clearance. Miners head-lamps have been tried on the Chesapeake & Ohio, but did not prove successful with the ordinary track men. It seems that the most satisfactory results are secured by the use of the ordinary oil-burning hand torch, where the work must be done under traffic. We have had no experience with electric lamps operated either from outside current or battery.

Electric Outfit Eliminates Fire Hazard

By W. H. Kirkbride
Engineer of Maintenance, Southern Pacific, Pacific System, San Francisco, Cal.

Our policy is to do away with open torches and lanterns as much as possible. They are used, however, by the section men while working on the track in the tunnels and by the carpenter gangs when making small repairs. These torches and lanterns are extinguished when trains are passing to eliminate the danger of fire or explosion from such sources as leaking oil or gas cars.

Whenever work of any magnitude is carried out the tunnels are illumined by electric light. For this purpose portable electric light generating sets are provided. One of these is set up outside the tunnel and the wires and lamps are strung inside as required. These generators are of 5 k. w. capacity, direct connected to a gasoline engine and furnish current at 105 to 120 volts.

The Southern Pacific, Pacific system, has 18 of these sets which are distributed on the various operating divisions where there are tunnels, so that they are available on short notice. The use of these portable electric light sets facilitates tunnel work to a considerable degree, and at the same time eliminates the fire hazard of torches and lanterns.

Kerosene Lanterns Usually Sufficient

By H. A. Roberts
Engineer, Maintenance of Way, Union Pacific, Portland, Ore.

When work in tunnels is necessary an effort is made to put on sufficient forces to take care of all track requirements for a considerable period of time, such as tie renewals, surface and lining, tightening bolts and other general maintenance work, building up battered joints, renewing bonding wires and other specialized work. Ordinarily, the lighting is provided by kerosene or acetylene torches placed approximately 400 ft. apart. If electric power is available, wires are strung through the tunnel and electric lights installed at frequent intervals. For ordinary maintenance work requiring only a small amount of light at infrequent intervals a car inspector's lamp with reflector is used.

Raising Spikes in Cold Weather

Should spikes which are driven tightly against the head of the rail be raised slightly prior to cold weather to avoid their breaking off in low temperatures?

Keep the Spikes Snug

By J. H. Reagan
Superintendent of Track, Grand Trunk, Detroit, Mich.

It is my practice to keep spikes fairly well tightened to the rail the year round. I do not believe there is anything in raising the spikes slightly from the rail prior to cold weather to avoid their breaking off in low temperature. A few spikes might break but they would be only those that were badly worn.

Spikes Will Adjust Themselves

By J. J. Hess
General Roadmaster, Great Northern, Seattle, Wash.

I have never heard of it being deemed good practice to raise spikes in cold weather to prevent their breaking. On the contrary, a great deal of labor has been expended in an effort to keep spikes as close to the rail as possible. There is no tie timber in use that prevents the spikes from adjusting themselves to the movement of the rail. It would entail a heavy expense in both labor and material if it were found necessary to loosen the spikes in winter.

Properly Driven Spikes Won't Break

By J. W. Powers
Supervisor, New York Central, Rochester, N. Y.

It is not necessary to raise the spikes slightly prior to cold weather to avoid their breakage if the spikes have been driven properly. To do so, a spike should be set upon its point almost perpendicularly, when receiving the first blow. The spiker should then deliver each stroke in such a manner as not to draw the spike in any direction until the last stroke, which should draw the head of the spike toward the rail and down to the flange at the same time.

Care should be taken not to strike the finishing blow

too hard as this will either crack the head or break it off. Besides if over-driven, the spike is pulled away from the rail.

Rail cut spikes are those which have become weakened by rusting or corrosion and should be replaced with new ones. It is only defective spikes and those that have been overdriven that will break with sudden changes in temperature.

Breakage Not Enough to Justify Loosening

By L. Coffel

Supervisor, Chicago & Eastern Illinois, Momence, Ill.

It is bad policy to raise spikes slightly prior to cold weather to avoid their breaking off during low temperatures. It is well known that spikes have an undesirable tendency to creep out of the tie with the wave motion of rails under traffic. As a matter of fact, a large percentage of track gaging is done during the months of low temperatures when it is necessary to keep the spikes tapped down snug to the rail. I have never found the percentage of breakage large enough to justify the time required to raise them, and then tighten them down again after the freezing weather.

Repairing Work Equipment

What are the relative advantages and disadvantages of concentrating the repair of work equipment such as ditchers and spreaders in a special organization under the control of the maintenace of way department as compared with turning this work over to the mechanical department? Is there any advantage in placing in charge of such work engineers who are also responsible for the operation of this equipment?

Better Work and Less Delay Under Maintenance Control

By H. R. Clarke

Engineer Maintenance of Way, Chicago, Burlington & Quincy, Lincoln, Neb.

The principal and almost only disadvantage of employing engineers to supervise the operation and repair of work equipment is, in the duplication to some extent of the supervisory force. There might be periods during the construction and maintenance season when the work equipment organization would not be worked to capacity but even then there would be running repairs and in some cases heavy emergency overhauling sufficient to justify the plan.

A central repair point for general overhauling and heavy repair work would be sufficient on many lines while on the larger systems, especially those well supplied with work equipment, two or more might be needed. There would always be light work and minor running repairs which would have to be handled at local division points to avoid delay and long haul to the central plant. This work would have to be done by the mechanical department. The crew of the machine would assist and in many cases do most of the work required and would at least see that the necessary work was properly done.

With the increase in work equipment which is so general and will no doubt continue, the question of duplication of effort and consequent increase in overhead become less serious. It can be still farther adjusted by having the same organization handle the repair of such maintenance of way material and small tools as is now handled on many roads by the mechanical or store department.

Repairs of motor cars, concrete mixers, weed mowers and such small equipment usually assigned to a division should be handled at a small division shop by a division force under the general supervision of the central maintenance of way organization.

When the capital invested in such equipment as steam shovels, ditchers, clam shells, drag lines, locomotive cranes, pile drivers, derricks, spreaders, weed burners, rail laying machines, rail loaders, power drills, mechanical tampers, etc., is considered, also the expense incurred if such equipment is not ready when wanted or when it fails on the job due to faulty repair work, the importance of proper and efficient organization to handle it becomes at once apparent.

The advantages of a plan such as the one suggested are many. First, the work would be under the supervision of a department and of men personally interested and responsible for nothing else, and not, as is so often the case now, by a department which handles maintenance department work as a side line.

Second in importance is the possibility of so planning and organizing that a large part of the actual repair work would be done by the same men who operate the equipment in the field. There would be at least two decided advantages in this. The man who operates any machine is more familiar with it than any one else can be, and knowing that he has to handle it and be responsible for the output and performance in the field he is naturally more anxious than anyone else to have it in first class condition.

To a large extent the use of all work equipment is seasonal, work being active from April to December and slack from January to April. This makes it difficult to offer steady employment but without this it is almost impossible to hold experienced and qualified men in the service. Using the field operating force on repair work during the slack season would at least partly solve this problem.

There is also an advantage in having the engineer of maintenance or other officer responsible for the use and operation of work equipment in general charge of the repairs and upkeep of the machine. Familiarized with the physical condition of the equipment through a competent subordinate officer, also as to the status of work under way and in prospect, he can arrange the shopping of equipment so that field work will not be handicapped.

In addition to handling the equipment the engineer of maintenance should and naturally will also be in charge of the personnel manning the machines. This knowledge that the man in charge of the work is also head of the department in which these operators are working will also result in a general tuning up of the morale of the department.

A Maintenance Officer Should Be in Charge

By J. B. Mabile

Supervisor Work Equipment, Chicago, Rock Island & Pacific, Chicago.

Work equipment should not be handled by the maintenance of way department to the entire exclusion of the mechanical department, for questions come up in connection with the purchase, operation and upkeep of such machinery in compliance with state and Federal laws, etc., with which the mechanical department men are familiar. Neither is it felt that work equipment should be handled exclusively by the mechanical department because problems arise in connection with the purchase, operation, and repair of these machines that can only be handled by maintenance men of long experience, as this knowledge is gained only by a

thorough study of the work which is done in the field.

My idea of the proper organization is to place in general charge of all system work equipment, as well as the men operating these machine, an officer from the maintenance of way department who has had some mechanical training. He should keep in contact with the men and the machines, inspecting the machines regularly and should confer with the mechanical department somewhat in advance of the time that the machines are to be shopped, furnishing them with a work report for the machines and with a list of parts necessary to be renewed. This enables the department to secure from the manufacturer the parts that can be purchased for less than it would cost to fabricate them in the shop and to be prepared to repair the machine when it is sent to the shop.

When the machine goes to the shop it should be accompanied by its operator and his assistants, who should report to the master mechanic or shop superintendent and do the work on the machine themselves. By "do the work", is meant all tearing down, filing, grinding, babbitting, and assembling, under the supervision of the mechanical department to insure compliance with mechanical standards. When the work is handled in this manner, it will be found that the men do good work on the machines and that the work improves as they become more experienced. This practice has put the machines of the Rock Island in such shape that failures no longer occur.

Maintenance Control Prevents Tampering

By a Supervisor of Work Equipment.

I am in favor of maintenance of way control. There is a marked contrast between locomotive work and that of work equipment. The average mechanic skilled in locomotive work cannot handle repair work on work equipment, such as steam shovels, steam ditchers, cranes, pile drivers, spreaders, etc., as successfully as mechanics specially trained in this line of work.

If the maintenance of way department handled this work the repair staff would naturally be work equipment operators skilled in this line of repair work. The employment of these men would give the maintenance of way department a perpetual staff of skilled operators which are indispensable during the operating season.

The storage is also handled more successfully by the maintenance of way department. At the close of the operating season there is always a large amount of small equipment to be gathered up and put in proper shape for the following season's work. This equipment consists of steam and internal combustion engine operated concrete mixers, air compressors, and cement guns; also boilers, water pumps, etc. This along with the heavy equipment as previously mentioned should be concentrated at a shop under the control of the maintenance department and the necessary staff required for the operation of equipment for the following season could be amply employed on repairs.

The small equipment, when repaired, should be stored in a suitable building to prevent parts from getting lost. This refers particularly to internal combustion engine-operated equipment. If it is required by the mechanical department, that department's responsibility ceases when repairs have been made. If it is placed in storage when the maintenance of way department requires its services it quite often finds that some parts are missing as a result of pilfering. If repaired and stored by the maintenance of way department it is sure to be in proper working order when required for service, as it has been constanltly under the observation of the officer in charge of work equipment.

A Fully Equipped Maintenance of Way Shop Justified

By S. C. Tanner

Superintendent Maintenance of Way Shops, Baltimore & Ohio, Martinsburg, W. Va.

On a railroad where the use of mainteance of way equipment is small and the mechanical department is not overburdened with motive power work better results no doubt can be obtained by having all repairs requiring shop work made by the machinery department, while light running repairs can be made by the operator.

However, a large majority of the railroads use maintenance of way equipment in such large quantities and variety that the volume of such work justifies the establishment of a fully equipped shop, centrally located to handle this special work. Such shops should be under the direction of an officer of the maintenance of way department who is fully familiar with the functional requirements of his equipment. With a force of mechanics especially trained on such equipment better repairs will be made at less expense, due to the concentration of interest in that direction. It is of the utmost importance to employ mechanics who have had previous experience in operating the equipment as they are in a better position to pick out the weak points and overcome them, sometimes by slight alterations in design to suit local conditions.

At our Martinsburg shop heavy repairs are made to all the equipment when needed, including ballast spreaders, ballast screens, steam shovels, steam ditchers, pile drivers, locomotive cranes, derricks and hoist, hoisting engines, concrete mixers, stone crushers, rail unloaders, track sweepers, water stations, pumps and boilers, stone drills and grout pumps, gasoline motor cars, hand cars and trucks, track and all other types of scales, bridge and building structural steel of all kinds including turntables, track material such as frogs and switches, plates, crossings, etc., including signal and switch lamps and all track accessories and tools.

Icy Tracks at Water Tanks

What precautions should be taken to prevent the accumulation of ice on tracks at water stations?

Keep the Drains Open

By Perry Everstine

Foreman, Bessemer & Lake Erie, Greenville, Pa.

The prevention of ice on tracks around water stations is accomplished through the observance of the usual year-around practices of good maintenance. At the approach of cold weather, however, an inspection should be made to determine if all drains are unobstructed and these cleaned if necessary. Ditches should be cleaned and any excess ballast removed from the shoulders to prevent possible fouling of the ditches The practice of sloping the ballast from the center so as to leave both ends of the ties open, on tangent, or open just on the low side, on curves, greatly facilitates drainage through water stations and the elimination of frozen track.

At water stations where locomotive ash pans are dumped and where no provision is made for the removal of the ashes other than by section labor, the foreman should arrange to remove these immediately

after the passage of each train during freezing weather, assigning a man to each station if traffic is heavy enough to justify it.

Avoid Leaking Valves and Spouts

By F. W. Hillman

Division Engineer, Chicago & Northwestern, Chicago, Ill.

Good drainage is a positive requisite at all water stations. This will go a long way toward preventing standing water and lessen the tendency for ice to form around tracks. If steam is near by it can be conducted in pipes along the inside of the rail to keep flange ways open. At water tanks with elevating spouts a trough can be built to catch the water that drains back from the spout when elevated and carry it away from the track. However, water on the tracks is usually the result either of leaky valves or spouts, which signifies poor care or of careless handling of water when filling tanks. Enginemen are usually careful when drawing water to see that the spout is over the water opening in the tender before opening the valve. There is no good reason why they cannot be as careful afterward and allow the spout to remain in the water hole a few moments after the valve is closed, so that it will be drained before being swung clear of the tender.

Discipline the Enginemen

By Edwin M. Grime

Supervisor of Bridges and Building, Northern Pacific, Fargo, N. D.

Practically 90 per cent of all the cases where ice accumulates on tracks at water stations are the result of carelessness in the handling of the facilities that have been provided to deliver the water. Occasionally a valve is found to be leaking but the competent water service foreman does not long tolerate such a condition. The fact that some water column pits and water tank designs call for a surface drain may make it appear that waste of water is to be expected but with the facilities in proper shape and proper discipline in force the waste should not exist.

I am reminded of an important station where two standpipes are located in the station platform. After some trouble with ice the order was issued that any fireman wasting water at this place would be dismissed. Since that time it has been noticed that firemen are able to close the water column valve properly before the spout is lifted out of the tender manhole and also that they can watch the flow of water into the tender and close the valve before the water begins to rise above the manhole opening and flood the top of the tender.

Much labor spent by section forces chopping ice during the winter season could be utilized to better advantage elsewhere if proper discipline could be enforced among those who handle the water facilities. The precautions to be taken therefore are almost entirely along the lines of education and discipline.

Steam Pipes Are Useful

By T. D. Morrison

Assistant Division Engineer, Baltimore & Ohio, Akron, Ohio.

The accumulation of ice on tracks at water stations is usually caused by overflow of locomotive tanks. Firemen fail to observe or to understand that the valve control of water columns, to prevent water hammer, is such that the water cannot be shut off instantly, but continues to flow for a period of 20 to 30 seconds during the closing of the valve. If the tank is filled before attempting to close the valve, the result is overflow of locomotive tanks. As a preventative measure, co-operation on the part of engine crews would be decidedly helpful.

Drainage should be given careful consideration, as the installation of a catch basin between tracks or in some other suitable location, draining into the water column pit or a nearby sewer will carry away considerable water before it can freeze. In locations where the drainage is sufficient to carry away the water after it is outside the rails, the ballast should be removed from 2 in. to 3 in. below the top of ties at the center of the track and 4 in. or 5 in. below the top of ties at the tie ends which will permit water to run away before very much can freeze.

Where live steam is available, a method of thawing the ice by the use of steam pipes, 1 1-2 to 2 in. in diameter, 12 in. within the rails on top of the ties and of sufficient length to cover the area effected by ice, is desirable. A similar arrangement at the ends of track pans has proven satisfactory.

Water Barrels on Bridges

What attention should be given to water barrels on bridges to insure that they are performing their function at all times?

Non-Freezing Solutions Impracticable in Cold Climates

By P. C. Perry

Division Engineer, Canadian National, Regina, Sask.

While water barrels are required for the protection of bridges, their care should be strictly up to the section foreman or track walker, unless a watchman is employed. Inspection should be made frequently to insure that the barrels are kept filled. In northern climates it is necessary to empty them during the winter. Under the climatic conditions experienced in western Canada, it is impracticable to provide a non-freezing solution. However, there is less danger of fire after freezing weather is experienced, and snow usually follows, making the hazard still less and providing a good material with which to combat fire.

Paint Barrels Inside

By Peter Aagaard

General Building Inspector, Illinois Central, Chicago.

The first attention to be given the water barrel is to provide good oak barrels, replace the flat hoops with round hoops of not less than ¼-in. diam., paint the barrels thoroughly inside and out, see that the barrels are properly secured at points where they are to offer protection, and provide suitable covers, chained to the barrels. In a cold climate the barrels should be thoroughly salted to prevent freezing. Also the section foreman should be instructed to stir the salt occasionally to keep it thoroughly dissolved, and the bridge and building foremen, on their monthly inspection trip, should see that the above recommendations are carried out.

Keep the Barrels Filled With Water

By E. B. Fithian

District Engineer, Missouri Pacific, Kansas City, Mo.

The maintenance of water barrels on bridges is for one purpose only and that is for use in case the bridge is discovered to be on fire. To be of service when needed they must be kept filled with water at all times. To insure that they are filled at all times, it must be the duty of the section foreman on whose section the water barrels are located, to inspect the barrels constantly.

Bridge foremen, bridge inspectors and supervisors of bridges and buildings, when making periodical inspections, should inspect the barrels for such repairs and renewals as may be needed as well as to make reports of any failure on the part of section foreman or others responsible, to keep the barrels filled.

In northern territory, the difficulty encountered in keeping barrels from freezing and bursting is overcome by placing salt in the water and a stick of wood for stirring. The salt is objectionable, however, for the reason that it quickly rusts the hoops, or the barrel itself if it is made of iron.

Keep a Bucket in the Barrel

By F. E. King
Division Engineer, Chicago, Milwaukee & St. Paul, Minneapolis, Minn.

On the Chicago, Milwaukee & St. Paul, water barrels are placed on all bridges having a timber substructure and also those having a timber floor, except those of the ballast top type. On bridges more than four or five spans in length up to approximately 10 spans, one water barrel is placed at each end of the bridge. Beyond this length, one water barrel is used for about every four or five spans. Frequently local conditions require more water barrels than this.

The barrels placed at the ends of the bridges are usually set in the ground so that a few inches of the barrel project above the surface of the ground. This projection above the surface of the ground serves at least two purposes. It prevents the barrel from being filled with ballast or other dirt and also keeps it in view for trackmen or trainmen working in that vicinity. The barrel is usually located a few feet away from the end of the bridge and out from the shoulder sufficiently to allow ready passage along the side of the track.

The barrel is always covered with a wooden lid and usually a large rock is placed on this lid so as to prevent the wind from blowing off the cover or trespassers from easily removing it. In some cases the cover is fastened down by a wire around a nail in the side of the barrel. In many cases a hole is cut in this lid and a pole placed in the barrel, to stir up the salt from time to time to insure that it remains in solution. A homemade wooden bucket is also placed in each water barrel. These homemade wooden buckets cost much less than factory-made buckets and are rarely removed from the barrels by trespassers as is the case with factory made pails.

On pile bridges requiring barrels to be placed other than at the ends of the bridge, the barrels are usually placed on the ends of caps and kept in place by wires around the barrel and attached to the bridge stringers. On steel bridges where it is necessary to place barrels at points other than the ends of the bridge a wooden platform is usually built for this purpose. This platform is usually at the level of the bridge floor. It is not desirable to place the barrel on the steel work where it can be avoided as the salt water leaking through the barrel corrodes the steel.

The solution used in these barrels varies somewhat. For the most part a solution of salt water is used on the bridges, although around buildings, where there is no adequate fire protection, a solution of calcium chloride has been used in many cases. While calcium chloride has some advantages as in withstanding low temperatures, it also has some disadvantages, as it is not as readily obtainable as common salt and in addition the inside of the barrel must be treated with some kind of asphalt compound to prevent the staves of the barrel from shrinking up.

In order to insure that water barrels are in serviceable condition when wanted, they are checked up during the annual bridge inspection, which is made early in the fall. They are also checked up on the spring inspection. Any defective water barrels, and any that are not properly filled and provided with buckets are listed and steps taken to correct the deficiency. There are also standing instructions for the section foreman at all times to see that these barrels are in proper condition for service.

To prevent the water from evaporating appreciably or employees or trespassers from dipping water out of these barrels for other purposes, the solution has been covered in cases with about one inch of crude oil.

With these precautions little difficulty has been encountered in maintaining the water barrels in fairly serviceable condition. Most of the barrels used are second hand oil barrels. The chief difficulty not overcome by this system is that the water freezes in low temperatures. However, there is usually less likelihood of fire during this season of the year.

Keep the Cover Tight and the Water Fresh

By H. Pollard
General Fire Inspector, Southern Pacific, San Francisco, Calif.

The water barrels are a first aid appliance and it is necessary that they be in first class condition at all times. Since they are in plain view of those riding on the observation platforms of trains they should be neatly painted, usually some shade of red, in order that they may present a pleasing appearance. Painting barrels performs another important service as it protects the wood and iron hoops.

They should be covered with a detachable cover, or one that can be lifted clear of the top of the barrel. This prevents the wind blowing the water out of the barrel, and dirt and trash from blowing in. To a certain extent it also prevents evaporation by excluding the sun and preventing the circulation of air.

Water barrels should be kept filled with water. This is necessary to provide the entire water capacity of the barrel for fire protection, and it prevents the barrel from becoming worthless due to shrinkage.

The water should be kept clean and fresh. It is very unpleasant as well as possibly injurious, to inhale the stench from foul water in a fire barrel. It is still more unpleasant in case of a fire to stand over a barrel and bale foul water out of it, after the water has been stirred up. The water can be kept fresh by changing it from time to time, and washing the barrel clean, when the change is made. In regions where water is scarce and it is necessary to preserve the water as long as possible, it can be kept in condition by adding a small amount of copper sulphate (blue stone) or three or four gallons of a solution of strong lime and water.

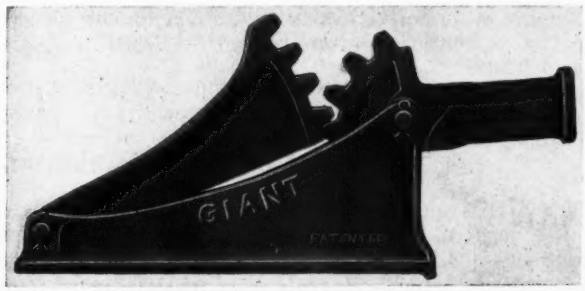
All fire barrels should be equipped with at least one fire bucket of about 10 quarts capacity, in good working condition. In order to prevent their becoming detached from the barrel they should be submerged inside of the barrel, suspended from a hook fastened to the cover, or from a hook attached to the top of the barrel. Special effort should be made to prevent fire buckets from resting on the bottom of the barrel. In case of fire much time may be lost in trying to get hold of a bucket in this position.

Barrels should not be allowed to leak, otherwise the contents of the barrel are wasted, thereby reducing their efficiency. The barrels also become stained and present an unsightly appearance, suggesting lack of attention. If salt is used to prevent freezing it attacks and corrodes the iron hoops and in time will render them useless. If the contents of the barrel are permitted to drip onto wooden members of a bridge, this will also cause them to decay, while it will cause corrosion on steel bridges.

New and Improved Devices

A Track Liner Using the Spur Gear Principle

THE GROWING interest in the application of mechanical devices to track maintenance as a means of increasing the output of the labor forces and improving the character of their work has resulted in the development of a lining tool which employs a different principle of operation than has heretofore been described in these colums. This new tool, which is called the Giant track liner, is a device of three parts, a base casting 6 in. wide and 15 in. long, which rests on the ballast between the ties, and two levers, one of which is supported on the back end of the base casting where it provides the means of operating the liner



The Giant Track Liner in the Open Position

while the second is connected to the front end of the base casting where it serves to push the track forward when the force is applied to the other arm.

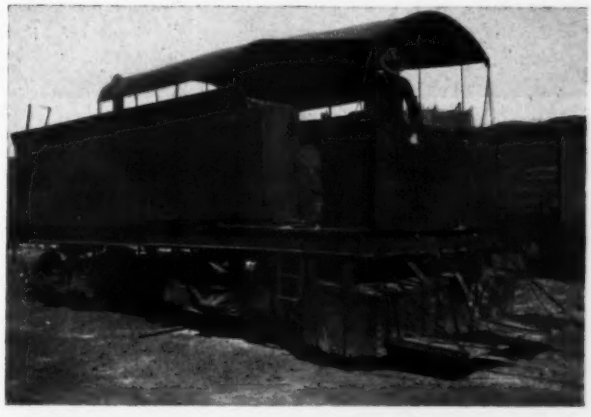
A distinguishing feature of this device is that, instead of employing the ratchet principle of operation common with track jacks, it depends for its operation upon the principle of the spur gear which is applied in this case by four teeth arranged in a segmental position on the forward end of the lifting arm and a similar set of teeth on the free end of the lining arm. Since these teeth intermesh the act of forcing the lifting arm downward raises the lining arm and at the same time thrusts it towards the track.

The device is made of cast steel and weighs complete 35 lbs., which makes it possible to carry the tool from place to place without difficulty. The device is operated by inserting a common lining or pinch bar in the socket of the lifting arm and pulling down on the lever. By operating the lever in this direction the likelihood of accidents is largely eliminated. The base of the casting is flat except for a lug across the back end and is so shaped as to fit readily between ties without digging into or otherwise altering the condition of the ballast. The leverage obtained is said to be such that two men with liners can throw over and line any ordinary single track while four men with four of the liners can throw over and line an ordinary switch or crossover. The device is protected from slipping away from the rail by the design of the base casting which directs any pressure downward instead of at an angle. The device which is the invention of a roadmaster on a western road has been used extensively on that and other roads where it is reported to have proven entirely practical. It is sold by the Gustin-Bacon Manufacturing Company, Kansas City, Mo.

Jointless Lining Used for Repairing Weed Burners

THE Colorado & Southern has been removing vegetation from its roadbed for some time by burning them with fuel oil through the agency of a weed burner of its own make. The equipment consists essentially of a burner attached to the front of an old engine tender, the latter serving both as the vehicle and as the oil storage. The burner is a box-like structure 3 ft. wide, 2 ft. high and 11 ft. long, which is suspended about 4 in. above the rail and carries on the front two hinged aprons, one above each rail, with which to spread the flames.

When first developed, the burner was lined with fire bricks, the arch of the bricks being supported by a rail. The operation of the burner, however, subjected the fire brick to excessive wear and tear. Principally, the joints between the brick were weakened by the vibration resulting from hauling the car from place to place at high rates of speed and injury also resulted through the sudden contraction of the brick when the burner was shut off and



A View of the Colorado & Southern's Weed Burner

the highly heated surfaces subjected to the cold air. Owing to this condition, it was necessary to make light repairs almost daily and extensive repairs were invariably required after a division had been burned over.

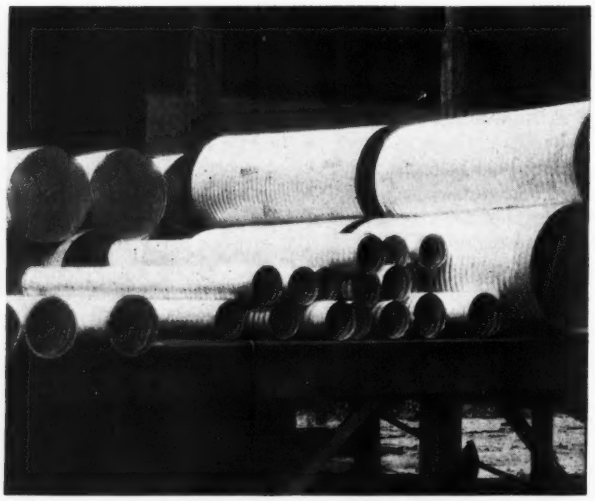
In an effort to eliminate this high maintenance the firebox of the weed burner was re-lined last spring with a

monolithic lining called "Plibrico" manufactured by the Jointless Fire Brick Company, 1130 Clay St., Chicago. This material was favored by reason of the total absence of joints to be attacked and weakened by the flames and because it expands and contracts as a mass. From the records of service the new lining has lived up to expectations, no repairs having been made as yet although the entire road has been burned over since remodeling the equipment. One result of the Colorado & Southern's experience has been the building of a similar weed burner on the Denver & Salt Lake although on this road the burner is fastened to a flat car instead of to a tender.

Galvanizing Metal Culverts After They Are Fabricated

THE MOST recent development in the manufacture of corrugated metal culverts is the perfection of a process for applying the galvanizing coat after the culvert has been completely fabricated in units of suitable length for shipment. The prevailing practice is to apply the galvanizing to the flat sheets, which are later corrugated, curved and riveted to form the culvert cylinders of various sizes. Under the new process the culvert pipes are fabricated complete from black sheets and then dipped by hand into the molten spelter so that the entire surface of the pipe, including the sheared edges of the sheets and the upset ends of the rivets, are thoroughly coated.

The primary purpose behind the development of this

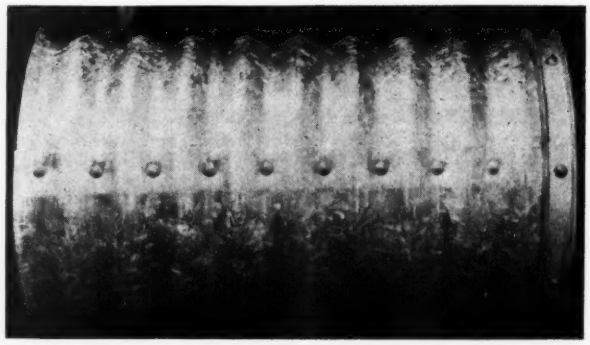


The Process Is Particularly Adapted to Small Sizes of Pipe

new process by the Wheeling Corrugating Company, Wheeling, W. Va., which is now applying it to the culverts fabricated in its plants, was to make it practicable to apply heavier coatings of zinc. The average coating now being applied at the plants of this company is 3.5 oz. per sq. ft., but it may be made much heavier if desired by the purchaser. Another object of the process is to afford greater latitude in the sizes of the culverts and the gages of the sheets used in their fabrication. Under the process of galvanizing culverts after manufacture, the zinc coating is not subjected to any stresses arising from the bending of the sheets. The new process, therefore, removes the usual limitations on the relationship between the thickness of the sheet and the diameter of the culvert and also on the thickness of the galvanizing coating in order to guard against fracture or scaling of the zinc coat.

The new process will, therefore, allow greater latitude in the manufacture of culverts of special sizes and of special gages to meet particular conditions. For example, heavier gages may now be used for small sizes where limitations on the bending of the sheets had heretofore precluded their use.

Although the change in the procedure of galvanizing has been made for the purpose of affording better pro-

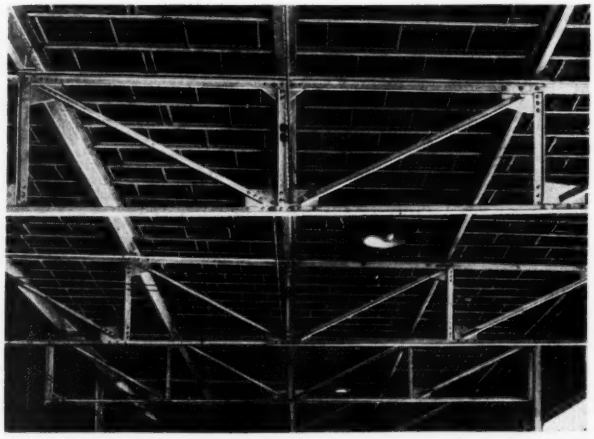


Galvanizing After Fabrication Insures a Perfect Coat of Zinc.

tection to the metal of the culvert, the Wheeling Corrugating Company will continue to fabricate its culverts from steel containing substantially 0.25 per cent of copper. Another feature manufactured according to this process for which special merit is claimed is the introduction of a ring of channel steel at the end of the culvert to serve as a reinforcement or protection for the portion of the pipe which projects beyond the top of the embankment.

Flat Roofs of Steel for Railway Buildings

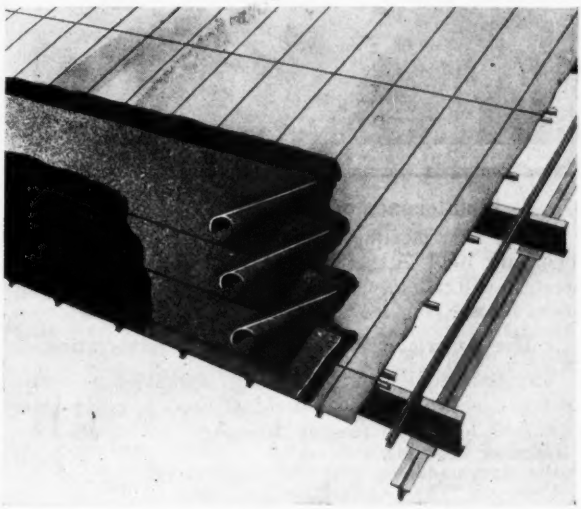
WHEN engaged recently in providing certain buildings of steel construction for one of the large railroads, the Truscon Steel Company, Youngstown, O., was confronted with the problem of providing a flat roof of the same material as that forming the other portions of the building. Heretofore little effort had been expended in this direction owing to the generally accepted theory that it would be difficult to provide a flat roof of steel which would be watertight and durable and at the same time economical. Considerable interest, therefore, attaches to the announcement by this company that it has developed a form of roof construction which permits



An Under Side View Showing the Appearance and Character of Construction

the erection of flat roofs of steel which have a slope of only one-half inch in twelve.

This roof consists of a deck of copper-bearing steel with stiffening angles welded to the plate to add to the strength and rigidity, upon which are applied built-up roofing materials which are cemented to the steel with roofing pitch. This type of roof is designed for a 40-lb. live load but has been tested up to 160 lbs. without failure. It is fully equipped with eaves, gables, ridges and gutters, all reinforced, and weighs but 4½ lbs. per sq. ft., which makes possible a considerable saving in the cost of trusses, columns and foundations.



Top View of the Steel Deck Showing How the Bond Between the Steel and Roofing is Secured

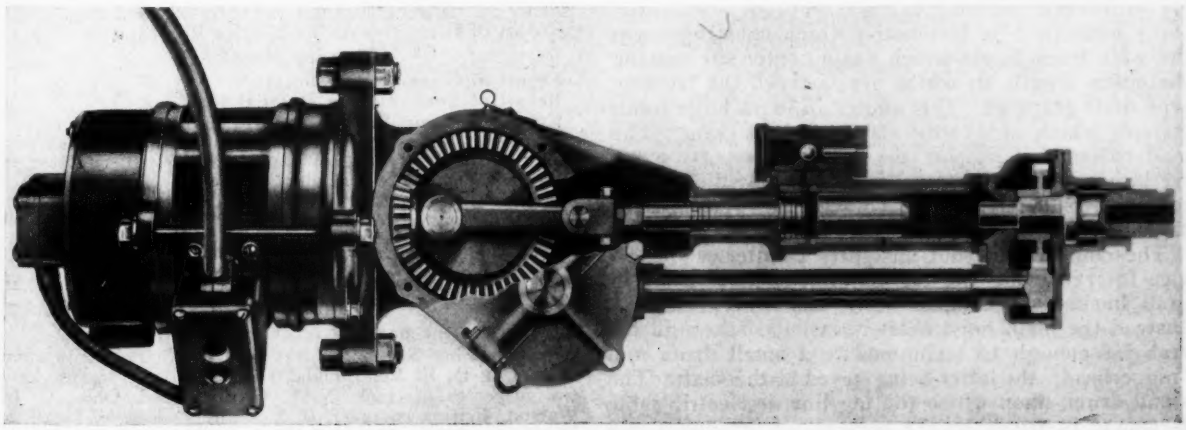
As the illustrations show, the roof is of non-combustible material while the under side presents a smooth surface that is easily painted. Similar to the other portions of the building in conection with which it is intended chiefly to be used, the deck is standardized and factory-built in units and is also of such design as to afford speedy erection by unskilled labor. Expansion and contraction are taken care of automatically at the joints which occur every two feet, preventing cracking, sagging, twisting or warping. The roofing is built up after the steel deck is in place, thus avoiding any open laps or joints. Contrary to the common belief, the insulating qualities of the steel roof are said to be exceptionally high, in conformity to heating standards.

An Ingenious Electric Drill

THE Pneumelectric is the appropriate name of a drill of the hammer or percussion type in which the rotary motion of the electric motor is transmitted into the straight, sharp strokes of the hammer through the agency of the compressed air device interposed between the motor and the hammer. The machine will be best understood by a study of the drawing which shows a longitudinal section through the machine from the base or flange to which the motor is attached to the holder for the drill bit or chisel. Here it is seen that the machine consists of a gear drive by means of which the motor actuates the piston, a combined dolly and chuck for attaching the drill bit, with a floating cylinder or hammer occupying the space in the barrel between the piston and the dolly but without any mechanical connection to either of them.

Briefly, the operation of the machine calls for the compression of air to the rear or left of the piston which is suddenly released, driving the hammer forward and causing it to strike the chuck, the important element in the success of the device being that the compressed air must be applied at the time of its maximum compression so as to drive the hammer forward suddenly with the greatest force. On the forward movement of the piston the air is drawn into the cylinder behind the piston through the intake valve mounted on top of the barrel. On the backward motion of the piston this valve is closed and the air is compressed to the rear of the piston at the same time that the hammer is drawn back by atmospheric pressure from air entering through the holes in the forward end of the barrel while a partial vacuum is being formed to the left of the hammer with the withdrawal of the piston to the left. Just as the piston clears the port at the rear end of the barrel in its movement to the left, the compressed air to the left of the piston is permitted to by-pass around the piston and is released into the space between the piston and the hammer which, of course, has the effect of driving the hammer to the right and causing it to strike the dolly chuck, transmitting the force of its blow to the drill or cutting steel. As soon as the hammer has moved far enough to clear the intermediate port the compressed air behind it is allowed to escape until the piston, which follows the movement of the hammer to the right, closes this port. The operation is then repeated.

Another feature of the machine is a gear connection

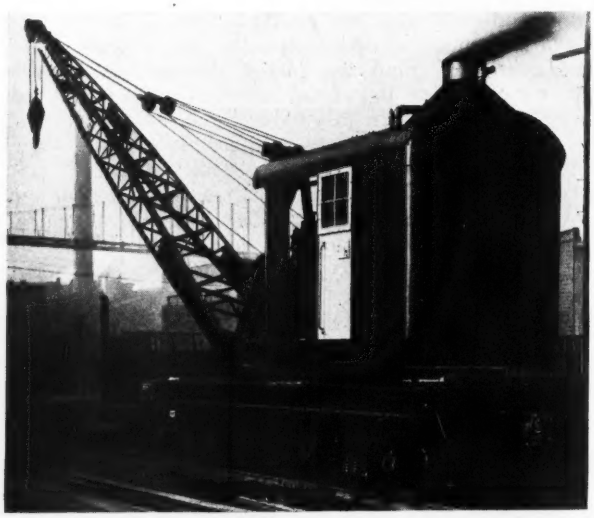


An Interior Longitudinal Section of the New Drill

from the motor to the chuck which provides for the rotation of the chuck when drilling, this feature being made inoperative when the machine is used for chipping. The motor can be operated from either direct or alternating current circuits of 110 to 125 volts. It strikes an average of a thousand blows per minute. This machine has been in service for the last three months and is said to have given good satisfaction where it was employed on work within its capacity. It is being manufactured by the Pneumelectric Corporation, Syracuse, N. Y.

An Improvement in a Locomotive Crane

THE Brown Hoisting Machinery Company, Cleveland, Ohio, has brought out an improved model of its No. 4, 20-ton capacity locomotive crane. The more noticeable changes are a higher boom hitch, a wider truck frame and a larger rotating ring. The contour of the cab has also been changed, presenting a more pleasing appearance and being of better construction. The crab has also been simplified by the elimination of one shaft, thereby making the remaining parts more accessible. The drums are independently driven and free running with outside band clutches. The worm gear boom hoist runs in an oil bath which, with the high boom hitch, simplifies booming with loads.



The Crane as Improved

An innovation in locomotive crane construction is the wide truck frame which has a center sill running the entire length, to which are fastened the friction-type draft gearings. This allows an extra large rotating ring which adds to the stability of the crane. The load rollers that support the revolving superstructure are larger and are removed from above without jacking up the superstructure. The vertical rotating shaft can also be removed from above.

The cumbersome and unsightly counterweight device for retrieving the tag line and electric cable in grab bucket and magnet work has been discarded. Instead the main hoist shaft is extended through the crab far enough to accommodate a small drum and "niggerhead," the latter being keyed to the shaft. The small drum, upon which the tag line or electric cable is wound is driven by the niggerhead through a slip friction device.

With the Associations

Maintenance of Way Club of Chicago

At the next meeting of the club, which will be held on February 10, J. A. S. Redfield of the Chicago & Northwestern will talk on "Track Maintenance from the Standpoint of the Engineer."

The American Wood Preservers' Association

The tentative program for the twenty-first annual convention which will be held at the Congress Hotel,

Tuesday Morning

Opening exercises.
President's address.
Paper on "The Comparative Resistance of Eighteen Species of Wood Destroying Fungi to Zinc Chloride," by C. Audrey Richards, assistant pathologist, Bureau of Plant Industry, in co-operation with the Forest Products Laboratory.
Paper on "A Theory on the Mechanism of the Protection of Wood by Preservatives," Part VI, continuation of the study of hydrocarbons, by Ernest Bateman, chemist in forest products, Forest Products Laboratory, Madison, Wis.

Tuesday Afternoon

Report of Committee on Preservatives.
Report of Committee on Ties, including presentation of a paper on "A One Movement Process for Impregnating Timber with Zinc Chloride and Petroleum" by A. M. Howald, Mellon Institute of Research, Pittsburgh, Pa.

Wednesday Morning

Report of Committee on Fir Ties.
Report of Committee on Car Lumber.
Report of Committee on Piling.
Paper on "The Relative Cost of Treated and Untreated Timber" by J. D. MacLean, engineer in forest products, Forest Products Laboratory, Madison, Wis.

Wednesday Afternoon

Paper on "Wood Preservation in Europe" by C. Marshall Taylor, superintendent Port Reading treating plant, Reading Company and Central Railroad of New Jersey, Port Reading, N. J.
Report of Service Bureau Board.
Report of Committee on Poles, Non-Pressure.
Paper on "When is Rot not Rot?" by W. H. Long.
Report of committee on Tie Service Records.

Thursday Morning

Report of Committee on Posts.
Report of Committee on Material Handling.
Report of Committee on Steam Treatments.
Paper on "Temperature and Moisture Changes in Wood Under Steaming Treatment" by R. M. Wirka, engineer in forest products, Forest Products Laboratory, Madison, Wis.
New business, including election of officers and selection of 1926 meeting place.

The Roadmasters' Association

At a recent meeting of the executive committee the year's work was organized and committees selected to report at the next convention, as follows:

Programming Section Work: E. W. Gully, roadmaster, C. R. I. & P., El Reno, Okla., chairman; J. B. Martin, general inspector of track, N. Y. C., Cleveland, Ohio; G. H. Watson, division engineer, B. & M., Woodsills, N. H.; F. S. Purdy, inspector of track, A. T. & S. F., Los Angeles, Cal.; M. H. Murphy, supervisor, C. & A., Mexico, Mo.; H. L.

Stein, roadmaster, C. B. & Q., Orleans, Neb.; W. C. Pruitt, roadmaster, M. K. T., Smithville, Tex.; Edward Sandell, roadmaster, U. P., Manhattan, Kan.; W. E. Robinson, roadmaster, F. E. C., Miami, Fla.; P. J. McAndrews, roadmaster, C. & N. W., Sterling, Ill., and William Ryan, B. & O., St. George, N. Y.

How to Inspect and Identify Ties for Renewals: J. G. Hartley, division engineer, Penna., New Castle, Pa., chairman; Dan Foley, inspector of maintenance of way, M. C., Jackson, Mich.; C. E. Shriers, A. T. & S. F., Topeka, Kan.; J. E. Bone, roadmaster, M. P., St. Louis, Mo.; D. K. Newmyer, roadmaster, S. P., Houston, Tex.; James Ryan, Jr., supervisor, C & E. I., Watseka, Ill.; Charles Newberg, roadmaster, C. & N. W., Chicago; Henry Ferguson, superintendent of track, C. N., Toronto, Ont.; O. J. Franklin, assistant to general roadmaster, C. M. & St. P., Janesville, Wis.; J. Seaberg, roadmaster, N. P., Minneapolis, Minn.; G. J. Daly, supervisor, Erie, Meadville, Pa.; J. P. Corcoran, roadmaster, C. & A., Bloomington, Ill.; J. W. Powers, supervisor, N. Y. C., Rochester, N. Y., and W. T. Hanly, division engineer, Penna., Erie, Pa.

Means of Prolonging the Life of Rail: C. W. Baldridge, assistant engineer, A. T. & S. F., Chicago, chairman; William Shea, general roadmaster, C. M. & St. P., Chicago; W. R. Wires, roadmaster, C. B. & Q., Aurora, Ill.; E. J. Cullen, division engineer, L. V., Auburn, N. Y.; W. R. Groshell, roadmaster, A. T. & S. F., Fresno, Cal.; P. J McAndrews, roadmaster, C. & N. W., Sterling, Ill.; G. W. Morrow, supervisor, N. Y., N. H. & H., New Haven, Conn.; William Wharry, general roadmaster, C. N., St. Thomas, Ont.; W. H. Sparks, general inspector of track, C. & O., Russell, Ky.; D. E. Callahan, supervisor, Penna., Pittsburgh, Pa.; M. Henry, supervisor, C. & E. I., Villa Grove, Ill.; T. F. Donahoe, general supervisor, B. & O., Pittsburgh, Pa., and H. P. Stafford, assistant general roadmaster, D. S. S. & A., Marquette, Mich.

Weeding of Tracks—Methods and Cost: J. B. Kelly, assistant general roadmaster, M. St. P. & S. S. M., Minneapolis, Minn., chairman; R. L. Longshore, division engineer, Wabash, Montpelier, Ohio; E. E. Crowley, Roadmaster, D. & H., Oneonta, N. Y.; James A. Rutledge, roadmaster, S. P., Duran, N. M.; J. Daugherty, division roadmaster, St. L.-S. F., Lebanon, Mo.; M. V. Holmes, roadmaster, A. T. & S. F., Ottawa, Kan.; W. H. McVan, roadmaster, A. C. & Y., Akron, Ohio; E. P. Hawkins, division engineer, M. P., Osawatomie, Kan.; W. O. Rutherford, track supervisor, C. G. W., Marshalltown, Iowa; J. J. Navin, supervisor, Penna., Chicago; J. E. Sowell, roadmaster, S. A. L., Raleigh, N. C.; A. Larson, roadmaster, N. P., Spokane, Wash.; A. W. Wehner, roadmaster, S. P., Lake Charles, La., and F. H. Hansen, division roadmaster, G. N., Grand Forks, N. D.

The Roadmasters' Responsibilities for Proper Relations with the Public: S. E. Shoup, engineering assistant to vice president and general manager, K. C. S., Kansas City, Mo., chairman; H. E. Clarke, engineer maintenance of way, C. B. & Q., Lincoln, Neb.; George E. Boyd, Railway Review, Chicago; L. M. Denney, supervisor of track, C. C. C. & St. L., Indianapolis, Ind.; J. P. Davis, engineer maintenance of way, C. I., Anderson, Ind.; F. T. Beckett, district engineer maintenance of way, C. R. I. & P., El Reno, Okla.; John F. Whitney, assistant engineer, B. & M., North Adams, Mass.; A. M. Clough, supervisor, N. Y. C., Batavia, N. Y.; A. L. Kleine, roadmaster, A. T. & S. F., Marceline, Mo.; H. M. Smith, roadmaster, N. & W., Wilcoe, W. Va.; B. E. Haley, general roadmaster, A. C. L., Rocky Mount, N. C., and J. B. Baker, engineer maintenance of way, Penna., Harrisburg, Pa.

Directory of Associations

American Railway Bridge and Building Association.—C. A. Lichty, secretary, 319 North Waller avenue, Chicago. Next convention, Buffalo N. Y., October 20-22, 1925.

American Railway Engineering Association (Works in co-operation with the American Railway Association, Division IV).—E. H. Fritch, secretary, 431 South Dearborn street, Chicago. Annual convention, Congress Hotel, Chicago, March 10-12, 1925.

American Wood Preservers' Association.—P. R. Hicks, secretary, Room 1146 Otis Bldg., Chicago. Next convention February 3-5, 1925, Chicago.

Bridge and Building Supply Men's Association.—B. J. Wilson, Pocket List of Railroad Officials, 605 Fisher Building, Chicago. Annual exhibit at convention of American Railway Bridge and Building Association.

National Association of Railroad Tie Producers.—J. S. Penney, secretary, T. J. Moss Tie Company, St. Louis, Mo. Next convention February 5-6, 1925, Chicago.

National Railway Appliances Association.—C. W. Kelly, secretary, Seeberger Building, 825 South Wabash avenue, Chicago. Annual exhibition at convention of American Railway Engineering Association. Exhibit, March 9-12, 1925, inclusive.

Roadmasters' and Maintenance of Way Association.—T. F. Donahoe, secretary, B. & O., Pittsburgh, Pa. Next convention September 15-17, 1925, Kansas City, Mo.

Track Supply Association.—W. C. Kidd, Ramapo-Ajax Corporation, Hillburn, N. Y. Annual exhibit at convention of Roadmasters' and Maintenance of Way Association.

The Material Market

A REVIEW of the iron and lumber markets during the past two months shows that the more active buying and upward tendency of prices which became manifest early in November are being well sustained as the new year opens. Although railroad buying as a whole was rather limited during the month of December, pending the completion of budgets, the placing of orders for cars and a considerable tonnage of rail and the general outlook afford ample assurance of large railway purchases early in the new year; while inquiries and actual orders received by the manufacturers from all sources were in sufficient volume to call for a considerable increase in the rate of production.

Prices are still moving upward at a moderate rate, as will be seen by the comparison of prices of iron and steel products shown in the table below:

	November				December			
	Pittsburgh		Chicago		Pittsburgh		Chicago	
Track spikes	$2.80 to	$3.00	$..... to	$2.90	$2.90 to	$3.20	$..... to	$2.90
Track bolts	3.75 to	4.00	.....	3.90	3.80 to	4.25	.....	3.90
Angle bars	.....	2.75	.....	2.75	.....	2.75	.....	2.75
Tie plates, steel	2.40 to	2.50	.....	2.35	2.35 to	2.50	.....	2.35
Boat spikes	.....	3.00	.....	3.00	.....	3.25	.....	3.25
Plain wire	$	2.50	.....	2.60	.....	2.60	.....	2.70
Wire nails	.....	2.75	2.80 to	2.85	.....	2.85	.....	2.95
Barb wire, galv.	.....	3.45	.....	3.55	.....	3.55	.....	3.65
C. I. Pipe, 6 in. to 12 in., ton	.....	.....	.....	50.20	.....	.....	.....	48.20
Plates	1.80 to	1.90	.....	2.10	1.90 to	2.10	.....	2.20
Shapes	1.90 to	2.10	.....	2.10	.....	.....	.....	2.20
Bars, soft steel	2.00 to	2.10	2.00 to	2.10	.....	2.10	.....	2.10
Rivets, struct.	.....	2.60	.....	.....	.....	2.60	.....	2.75
Reinforcing bars	.....	.....	.....	.....	.....	2.10	.....	.....
Rein. bars (rails)	.....	.....	.....	.....	.....	.....	.....	2.00
Open hearth rails, per gross ton, f. o. b. mills								43.00

Even more marked advances are to be noted in the following table of scrap prices:

PRICES PER GROSS TON AT CHICAGO

	November		December	
Relaying Rails	$27.00 to	$32.00	$27.00 to	$32.00
Rails for rerolling	18.00 to	18.50	21.00 to	21.50
Rails for less than 3 ft. long	19.00 to	19.50	21.00 to	21.50
Frogs and switches cut apart	17.50 to	18.50	19.50 to	20.00
Steel angles bars	18.50 to	19.00	20.00 to	20.50

Statistics issued by the Southern Pine Lumber Manufacturers Association covering the operations for 1924, show that the production of lumber in that year exceeded the output of any other year except 1916, while the demand for lumber exceeded that of any previous year. Orders on hand at the close of the year averaged 2,000,000 ft. b. m. per mill, as compared with 1,833,000 ft. b. m. at the close of 1923. The prices of Southern pine lumber, as indicated by the table covering typical items, which appeared below, are now definitely higher than they were a month ago. Current reports from Douglas fir mills disclosed no material change in quotations.

SOUTHERN PINE MILL PRICES

	Nov.	Dec.
Flooring, 1x4, B and B flat	$42.20	$46.50
Boards, 1x8, No. 1	32.35	34.60
Dimension, 2x4, 16, No. 1, common	26.80	28.75
Dimension, 2x10, 16, No. 1, common	27.50	29.60
Timbers, 4x4 to 8x8, No. 1	26.50	28.50
Timbers, 3x12 to 12x12, rough	34.35	34.00

DOUGLAS FIR MILL PRICES

Flooring, 1x4, No. 2, clear flat	$24.00	$27.00
Boards, 1x8, 6 to 20, No. 1, common	17.50	17.50
Dimension, 2x4, 16, No. 1, common	18.50	18.50
Dimension, 2x10, 16, No. 1, common	18.00	18.00
Timbers, 6x6 to 8x8, No. 1, common	23.00	23.00
Timbers, 10x10 to 12x12, rough	18.00	18.00

Recent reductions in the price of Portland cement would seem to indicate moderate readjustments rather than any general tendency. The following are prices per barrel in carload lots not including packages:

New York	$2.15	Minneapolis	$2.42
Pittsburgh	2.19	Kansas City	2.42
New Orleans	2.80	Dallas	2.05
Chicago	2.10	Denver	2.84
Cincinnati	2.37	San Francisco	2.61

News of the Month

The number of employees killed on the railroads of the country in the first six months of 1924 is reported as 993, or 25 per cent less than the total number for the same months of 1923, while the injuries are reported to have decreased in the same proportion.

Radio broadcasting was utilized extensively by the western railroads in keeping trains in operation during the snow storm and extremely cold weather which swept over the country late in December. At one time virtually all of the broadcasting stations in Chicago assisted the railways in locating trains that could not communicate with headquarters on account of breaks in telegraph lines, which was the principal damage resulting from the storm.

In the past year 42 applications were made to the Interstate Commerce Commission for authority to build a total of 2,564.66 miles of new lines or extensions, 52 for authority to abandon 949.08 miles of line, while 26 other petitions were filed for authority to operate or to acquire and operate 2,552.56 miles of line. Authority was definitely issued for the construction of 1,313.35 miles of new lines and to abandon 463.83 miles of lines.

Freight car loadings continue to run considerably ahead of the 1923 figures, although now below the peak for 1924, which occurred in the week ending October 25. The total for the week ending December 13, the last week of record, totaled 956,761 cars, an increase of 57,004, as compared with the corresponding week of 1923, and an increase of 77,709 cars, as compared with 1922. This was a decrease of 11,495 cars from the preceding week of 1924.

On June 30, 1924, 4,343 railway postoffice trains were in operation on 200,517 miles of railway postoffice service, with 273,359,735 miles of annual travel. There were also 15,472 closed pouch trains, according to the annual report of the postmaster general. The report gives 5,135 as the number of full and apartment mail cars owned by the several railroads and operated for the postal service. The appropriation for the fiscal year for inland transportation via railroad routes was $94,300,000.

Tentative valuation reports had been served on roads having a total of 75,375 miles of line prior to October 31, 1924, according to the annual statement of the Interstate Commerce Commission. This represents 30.84 per cent of the total mileage, as against 22.03 per cent of the mileage for which tentative valuations were served one year previous. The underlying engineering reports had been completed on 235,088 miles of road up to October 31, 1924, which is 88.47 per cent of the total mileage, while the underlying land reports had been completed for 233,247 miles, or 95.40 per cent of the total railway mileage in the country. In its report the Interstate Commerce Commission deplores the delay in the completion of tentative valuations.

A national conference on the utilization of forest products was held in Washington, D. C., on November 20, at which plans were adopted for an organized permanent campaign for the better utilization of forest products, particularly by stimulating the proper agencies to apply commercially the available knowledge on the subject as well as to supply additional knowledge on better utilization as the result of research and experience. A committee, representative of the lumber manufacturrs, distributors, wood using industries, architectural engineers, and heretofore constituting the Central Committee on Lumber Standards, which has been co-operating with the Department of Commerce and the Department of Agriculture, will assume the responsibility of guidance of the movement.

Eight persons were killed and seven injured in a wreck on December 20, when the rear car of an eastbound Minneapolis, St. Paul & Sault Ste. Marie passenger train was derailed at a switch approaching a bridge at Chippewa Falls, Wis., and fell 60 feet into the Chippewa river. The cause has not been definitely ascertained.

A total appropriation of $4,913,500 was recommended for the Interstate Commerce Commission by the president in his annual budget transmitted to Congress, while $292,805 was requested for the Railway Labor Board. The Interstate Commerce Commission recommendation represents an increase of $271,636 as compared with 1923, while the labor board appropriation shows a reduction of $25,395. An item of $1,000,000 was included for the coming year to enable the Interstate Commerce Commission to complete the valuation of the property of carriers in order to prosecute the recapture of excess earnings. Since the president's message, Senator Cummins has introduced a resolution requesting an increase on the valuation appropriation from the $1,000,000 recommended to the $2,369,626 which the commission requested originally.

The Delaware & Hudson has begun the operation of a locomotive which is a radical departure in a number of ways from existing types in this country. This locomotive, which has been christened the Horatio Allen, after the engineer who purchased for the Delaware & Hudson the first steam locomotive which was received in this country, weighs 273 tons, is designed to carry a steam pressure of 350 pounds and will develop a maximum tractive effort of 104,000 pounds. The familiar self-contained type of multitubular boiler for steam locomotives, accompanied with a superheater, has been retained in the design but instead of the usual water leg firebox with its flat sheets and staybolts the firebox of the Horatio Allen has been built up of self-supporting cylindrical structures in the form of drums and tubes disposed horizontally and vertically and which require no stays. The engine is patterned after a consolidation type locomotive but has low pressure cylinders on one side for using steam the second time. The engine is expected to develop one-third more with one-third less consumption of fuel and water than the corresponding Consolidation locomotives. It is built for freight service.

Most of that part of President Coolidge's message to Congress on December 8, in which he discussed railroad matters was devoted to the subject of consolidation. While expressing himself to the effect that the advisability of consolidating the roads into larger units is supported by the best opinion in the country, he stated that: "The consolidation needs to be carried out with due regard to public interest and to the rights and established life of various communities. It does not seem to me necessary that we anticipate any final plan or adhere to any artificial or uncharitable project which shall stipulate a fixed number of systems but rather to approach the problem with such a latitude of action that it can be worked out step by step in accordance with the comprehensive consideration of public interest." With reference to the desirability of altering the present laws of the country

he said: "Those portions of the present law contemplating consolidation are not sufficiently effective in producing expeditious action and need amplification of the authority of the Interstate Commerce Commission particularly in affording a period for voluntary proposals to the commission and in supplying government pressure to secure action after the expiration of this period."

Labor News

Decisions of the Labor Board

Among recent decisions of the United States Railroad Labor Board is one relating to employees of the maintenance of way department and because it concerns important points of issue it is reviewed in considerable detail below:

Maintenance of Way Agreement Revised

In a decision effective December 1, 1924, the Labor Board made certain revisions of the agreement between the railroads and the United Brotherhood of Maintenance of Way Employees and Railway Shop Laborers, following presentations with respect to certain clauses under dispute which are as follows:

Article V.

Sec. (a 5) Sunday work, full day period.
Sec. (a 6) Sunday work less than full day period.
Sec. (a 8) Overtime.
Sec. (a 9) Calls.
Sec. (a 12) Watchmen, etc.
Sec. (i) Assignments traveling.
Sec. (j) Reporting and not used.
Sec. (m) Travel time.

Article VI.

Sec. (o) Week-end visits.

The decision of the board reaffirms most of these clauses in the form in which they appeared in the agreement covered in the decision of the board dated December 14, 1921, but certain exceptions and changes were incorporated in Sections (a 5), (a 6), (a 8), and (m) of Artivle V. Sections (a 5) and (a 6) covering Sunday and holiday service provide for the payment of time and one-half instead of straight time for work on Sundays and holidays to all employees except those in service requiring continuous operations, such as the tenders at power houses, pumping plants, bridge and crossing watchmen, etc., who are regularly expected to work on Sundays and holidays, and who are to be compensated on the same basis as on weekdays. Article V, Section (a 8) covering overtime, reaffirms the provision of this clause with respect to the payment of time and one-half for overtime after the tenth hour but provides that time and one-half for overtime for the ninth and tenth hours shall be paid laborers employed in and around shops, roundhouses and elsewhere where they come in direct contact with shopcrafts employees who are paid under an agreement with similar provisions. Article V, Section (m) covering travel service has been modified to outline the provisions in more specific form and reads as follows:

"Article V, Section (m). Employees, except as provided by sections (f) and (i), Article V of Decision No. 501, who are required by the direction of the management to leave their home station, will be allowed actual time for traveling or waiting during the regular working hours. All hours worked will be paid for in accordance with practice at home station. Travel or waiting time during the recognized overtime hours at home station will be paid for at the pro-rata rate.

"If during the time on the road a man is relieved from duty and is permitted to go to bed for five or more hours, such relief time will not be paid for, provided that in no case shall he be paid for a total of less than eight hours each calendar day, when such irregular service prevents the employee from making his regular daily hours at home station. Where meals and lodging are not provided by the railroad, actual necessary expenses will be allowed."

Personal Mention

General

S. S. Long, assistant division superintendent on the Chicago & North Western, with headquarters at Winona, Minn., and before that a division engineer has been promoted to superintendent of the Black Hills division, with headquarters at Chadron, Neb.

J. W. Walter, division engineer of the Slaton division of the Panhandle & Santa Fe, with headquarters at Slaton, Tex., has been promoted to trainmaster, with the same headquarters. Mr. Walter was born at Slaton, Tex., on May 9, 1885, and entered railway service in the engineering department of the Atchison, Topeka & Santa Fe at Pueblo, Colo., in February, 1903. From that date until March, 1913, he served as assistant engineer and resident engineer and on valuation work on various lines in Texas, on the latter date becoming pilot engineer at Amarillo, Tex. From November, 1915, to June, 1916, he served as division engineer at Amarillo and from the latter date until October, 1916, was division engineer, with the same headquarters. In October, 1916, he became assistant engineer construction at Shattuck, Okla., and in April, 1921, was appointed division engineer of the Panhandle & Santa Fe at Slaton, Tex., which position he was holding at the time of his recent promotion.

Robert Faries, division engineer on the Pittsburgh Division of the Pennsylvania System, with headquarters at Pittsburgh, Pa., has been promoted to division superintendent at Buffalo, N. Y., succeeding **E. B. Whitman**, resigned. Mr. Faries was born at Bellwood, Pa., on November 30, 1881, and entered railway service as a rodman in the track supervisor's office of the Pennsylvania at Gallitzen, Pa., on May 5, 1899. After several years' service on the Pittsburgh division, he was promoted to transitman on February 1, 1902, serving in this capacity until May 15 of the same year, when he was promoted to assistant supervisor of track at Brownsville, Pa. On November 1, 1903, he was transferred to Philadelphia, where he remained until August 1, 1905, when he was promoted to supervisor of track at Jamesburg, N. J. He was subsequently transferred to Trenton, N. J., on November 9, 1908; to Washington, D. C., on January 1, 1912, and to Baltimore, Md., on May 10, 1916. On June 1, 1917, he was promoted to division engineer, with headquarters at Elmira, N. Y., being transferred to Williamsport, Pa., on October 25 of the same year and the Pittsburgh division on February 1, 1916, where he continued to serve until his promotion to division superintendent as noted above.

Robert Faries

Engineering

A. F. Dailey has been promoted to the newly created position of assistant engineer of the Fifth and Sixth districts of the Los Angeles & Salt Lake, with headquarters at Milford, Utah.

J. W. Brozo, roadmaster on the Colorado division of the Atchison, Topeka & Santa Fe, with headquarters at Pueblo, Colo., has been promoted to division engineer of the Rio Grande division, with headquarters at San Marcial, N. M., to succeed **F. S. Hughes**, who has been transferred to the Slaton division of the Panhandle & Santa Fe, with headquarters at

Slaton, Tex., in place of **J. W. Walter**, who has been promoted to trainmaster.

J. R. Hickox, principal assistant engineer of the Chicago, Burlington & Quincy lines west, with headquarters at Lincoln, Nebraska, has been promoted to the newly created position of hydraulic engineer, system, with headquarters at Chicago.

R. Swenk, supervisor of track on the Pennsylvania, with headquarters at Paoli, Pa., has been promoted to division engineer, with headquarters at Pittsburgh, Pa., succeeding **Robert Faries**, who has been promoted to superintendent of the Buffalo division.

B. Herman, assistant to the vice-president of the Southern, with headquarters at Washington, D. C., has been promoted to chief engineer, with the same headquarters, succeeding **T. H. Gatlin**, who has resigned. **H. J. Haar, Jr.**, assistant engineer maintenance of way, with headquarters at Danville, Va., has been promoted to office engineer, with headquarters at Charlotte, N. C., succeeding **C. P. Asbury**, who has been promoted to engineer maintenance of way of the Northern district, with headquarters at Danville. **G. L. Sitton**, engineer maintenance of way at Danville, has been promoted to chief engineer maintenance of way, with headquarters at Charlotte, succeeding **J. B. Akers, who has been promoted** to assistant to the vice-president in charge of engineering.

Mr. Akers was born at Danville, Va., on March 16, 1884. Following his graduation from Washington and Lee University in 1904, he entered railway service with the Southern as an assistant supervisor on the Asheville division, being appointed levelman on September 1, 1905, which position he held until March 1, 1906, when he was promoted to transitman. On January 1, 1907, he was promoted to assistant engineer on the Middle district, serving in this capacity until August 20, 1911, when he was promoted to acting engineer maintenance of way of the Middle district, with headquarters at Knoxville, Tenn., being promoted to engineer maintenance of way of the same district in October of the same year. On November 1, 1921, he was promoted to chief engineer maintenance of way and structures, lines east, with headquarters at Charlotte, N. C., where he remained until his recent promotion to assistant to the vice-president.

J. B. Akers.

Mr. Sitton was born at Anniston, Ala., on October 21, 1888, and graduated from the University of Tennessee. He entered railway service as a rodman on the Southern at Knoxville, Tenn., on June 13, 1902, and subsequently served as a laborer from 1908 to 1909, and as a transitman from 1909 to 1911, being promoted in the latter year to assistant engineer at Knoxville. In 1913, he was appointed assistant roadmaster at Greenville, S. C., where he remained until January, 1914, when he was promoted to roadmaster, with headquarters at Charleston, S. C. In July of the same year he was promoted to resident engineer at Richmond, Va., serving in this capacity until 1917, when he was promoted to engineer maintenance of way, with the same headquarters. In 1918, he was transferred to the Northern district, with headquarters at Danville, Va., where he remained until his recent promotion to chief engineer maintenance of way. His entire service has been with the Southern.

D. M. Lamdin, engineer of construction of the Atlantic Coast Line, with headquarters at Wilmington, N. C., has been promoted to engineer maintenance of way, with headquarters at Jacksonville, Fla., succeeding **H. G. Laird**, resigned. **R. L. Groover** has been appointed office engineer, with headquarters at Wilmington, to succeed **D. B. Packard**, who has been promoted to engineer of construction, succeeding Mr. Lamdin.

Mr. Packard was born at Greenville, Pa., on January 8, 1881, and graduated from Cornell University, following which he entered railway service with the Bessemer & Lake Erie in 1905. In 1906 he left the service of this road to enter the employ of the Norfolk Southern as a resident engineer on bridge construction, remaining in this capacity until 1908, when he left railway work to become city engineer at Washington, N. C., later becoming bridge engineer for Beaufort county, N. C. In 1910, he returned to the employ of the Norfolk Southern as a resident engineer and later as chief of the party on location up to 1912, when he left the employ of that road and was appointed resident engineer on the Atlantic Coast Line. From 1912 to date, Mr. Packard has been continuously with this latter road, being subsequently promoted to assistant engineer, division engineer, engineer of surveys and office engineer, the position which he held at the time of his recent promotion to engineer of construction.

J. S. Bassett, assistant division engineer of the Central Kansas & Colorado division of the Missouri Pacific, with headquarters at Hoisington, Kans., has been promoted to division engineer of the newly created Little Rock division, with headquarters at McGehee, Ark.

H. C. Mann, an engineer of construction on the Union Pacific, has been promoted to assistant chief engineer of the Union Pacific, with jurisdiction over the Los Angeles & Salt Lake and headquarters at Los Angeles, Cal., to succeed **A. Maguire**, who has resigned. Mr. Mann was born on August 30, 1885, at Missouri Valley, Iowa, and is a graduate of the University of Nebraska. He entered railway service in August, 1908, as a rodman on the Canadian Pacific, where he remained until December, 1908. In April, 1909, he entered the service of the Union Pacific as an instrumentman on double track work and served in this capacity and that of assistant engineer on second track in Nebraska and Wyoming until January, 1912, when he entered upon valuation work at Omaha. From October, 1912, to October, 1918, he was assistant engineer on branch line and second track construction in Utah and Wyoming, at the close of which he was assigned to special work in the general offices. He was appointed engineer accountant in September, 1919, with headquarters at Omaha, and continued in this capacity until April, 1922, when he was placed in charge of the construction of the Columbia River bridge. After the completion of this work he was engaged on the construction of tourist facilities for the railroad in South Utah until November 15, 1924, when he was promoted to assistant engineer at Los Angeles.

Eric E. Stansbury, whose promotion to division engineer of the Southern Pacific, with headquarters at El Paso, Tex., was reported in the December issue, was born on May 31, 1882, at Alexandria, Va., and studied at Columbian University, Washington, D. C. He entered railway service in December, 1903, as a special apprentice on the Baltimore & Ohio, and continued in this capacity until December, 1905, when he became material inspector and assistant in the physical laboratory at Baltimore, Md. He left the Baltimore & Ohio in January, 1907, to become a rodman on railroad construction at Casa Grande, Mex., where he remained until December, 1907, when he entered the service of the El Paso & Southwestern as a rodman at Tucumcari, N. M. He was appointed assistant engineer in February, 1910, and resident engineer in October, 1913, which position he was holding at the time of his recent promotion to division engineer of the Mexico division of the Southern Pacific, Pacific system.

F. L. Guy, whose promotion to division engineer of the Rio Grande division of the Southern Pacific, with headquarters at El Paso, Tex., was reported in the December issue, was born on March 16, 1883, at Gallipolis, Ohio, and attended Kansas University from 1904 to 1906. He first entered railway service in 1901 as a chainman on the Atchison, Topeka & Santa Fe and served in this capacity and successively as rodman, masonry inspector, transitman and assistant engineer until 1904, six months of which period was on

the Kansas City Southern and about a year on the Chicago, Rock Island & Pacific. In 1904 he served as a locating engineer on a railroad survey in Western Oklahoma. Re-entering the service of the Santa Fe, in April, 1906, he continued in this capacity until March, 1907, when he was promoted to assistant engineer on second track construction. On July 1, 1907, he was promoted to division engineer at Arkansas City, Kan., and in May, 1913, was transferred to Topeka, Kan., where he remained until July, 1914, when he became a resident engineer on the El Paso & Southwestern at Douglas, Ariz., the position he was holding at the time of his recent appointment.

Track

A. Rimstead, roadmaster on the Canadian National, Western region, with headquarters at Biggar, Sask., has been transferred to Edmonton, Alta., to succeed **E. C. Dunlop,** who was transferred to the Manitoba district.

J. Lucid has been appointed to roadmaster of the Platerville district, Sacramento division, of the Southern Pacific, with headquarters at Sacramento, Cal., to succeed **F. H. Depew,** who has been transferred to the Salinas district, with headquarters at Watsonville Junction, Cal.

J. P. Garstang, relief roadmaster on the Canadian Pacific, Alberta division, has been promoted to roadmaster at Stirling, Alta., to succeed **A. E. Stuart,** who has been transferred to Bassano, Alta., to succeed **J. H. Sheahan,** who died on November 12.

H. B. Lincoln, assistant supervisor of track on the New York Central, has been promoted to supervisor of track, with headquarters at Carthage, N. Y., succeeding **T. J. Dailey,** transferred to the Selkirk yards.

Tom A. Blair has been promoted to roadmaster of the First and Canon City districts of the Colorado division of the Atchison, Topeka & Santa Fe, with headquarters at Pueblo, Colo., to succeed **J. W. Brozo,** who has been promoted to division engineer, as noted elsewhere in these columns.

E. C. Swittenberg, supervisor on the New Orleans & Great Northern, has been promoted to roadmaster on the St. Louis Southwestern, with headquarters at Corsicana, Tex., to succeed **J. L. Lockhart,** who has been assigned to other duties. Mr. Swittenberg was born on January 28, 1885, in Trenton, Smith county, Miss., and attended college for two years. He entered railway service in 1889 as a water boy on the Illinois Central, following which he served in various capacities, including that of extra gang foreman, until 1909, when he became a track foreman on the New Orleans & Great Northern. He was promoted to supervisor, with headquarters at Bogalusa, La., on October 21, 1911, and was serving in this capacity at the time of his promotion to roadmaster on the St. Louis Southwestern.

Vincent T. Jozwiak, whose promotion to roadmaster on the Chicago & North Western, with headquarters at Clintonville, Wis., was published in the December issue, was born on February 16, 1885, at Winona, Minn. He entered railway service on the Chicago & North Western as a section laborer at Bessemer, Mich., In May, 1900. In 1904 he was promoted to section foreman and held this position until July, 1907, when he was transferred to Ironwood in the same capacity. He was promoted to extra gang foreman on the Ashland division the following spring, holding this position until October, 1917, when he was promoted to general foreman in the mining district. In September, 1917, he was promoted to assistant roadmaster at Ironwood, which position he was holding at the time of his recent promotion to roadmaster, with headquarters at Clintonville, Wis.

G. H. Schlotterer, assistant supervisor of track on the Pennsylvania System, with headquarters at New Brunswick, N. J., has been promoted to supervisor of track, with headquarters at West Brownsville, Pa., succeeding **J. L. Gressitt,** transferred to Paoli, Pa., to succeed **R. Swenk,** promoted to division engineer, as noted elsewhere in these columns. **David Davis, Jr.,** assistant supervisor on the Buffalo division, has been transferred to New Brunswick to succeed Mr. Schlotterer. Mr. Schlotterer was born at Brooklyn, N. Y., on January 29, 1893, and graduated from Rutgers College in 1915, entering railway service as a chairman in the engineering corps of the Pennsylvania on July 1 of the same year. He was subsequently promoted to transitman, and, in April, 1917, was granted a leave of absence to serve as a commissioned officer in the American Expeditionary Forces. He was promoted to assistant supervisor on the Trenton division on June 1, 1919, following his discharge from the army. During 1921 he was transferred to the Middle division, and in 1923 to the New York division, with headquarters at New Brunswick, where he continued to serve until his recent promotion to supervisor, as noted above.

J. J. Wise, whose promotion to roadmaster on the Chicago & North Western, with headquarters at Norfolk, Neb., was reported in the December issue, was born on July 22, 1885, in Red Willow county, Neb., and entered railway service on August 1, 1889, as a section laborer on the Chicago, Burlington & Quincy. He enlisted in the U. S. Army on August 1, 1904, and upon his discharge in 1909 he again entered railway service on the Atchison, Topeka & Santa Fe. He was promoted to section foreman on May 10, 1909, but left railway service in November of the same year to become a concrete inspector for the Colorado Fuel & Iron Company. He re-entered railway service on April 6, 1912, as a section foreman on the Chicago & North Western, and was serving in this capacity at the time of his recent promotion to roadmaster.

W. Christianson, whose promotion to roadmaster of the Tisdale subdivision of the Canadian Pacific, Saskatchewan district, was reported in the December issue, was born on November 10, 1889, in Sweden, and entered railway service on May 3, 1909, as a trackman on the Canadian Pacific at Raith, Ont. He was promoted to section foreman at Iergolf, Ont., on August 1, 1911, and in the spring of 1920 was appointed gang foreman. He served as extra gang foreman on steel laying during the summers of 1922 and 1923, and during the summer of 1924 was assistant switch gang foreman and extra gang foreman. Upon the completion of this work he returned to his section at Iergolf, Ont., where he was serving at the time of his recent promotion to roadmaster.

Lee S. Sutherland, whose promotion to roadmaster on the Southern Pacific, with headquarters at Jacksonville, Tex., was reported in the November issue, was born in 1879 and entered railway service in 1893 as a trackman on the Pennsylvania. He was promoted to section foreman in August, 1899, and, three months later, was transferred to an extra gang, where he served as a foreman until 1907, when he became a general foreman on a construction gang. In February, 1909, he moved to Houston, Tex., where he entered the service of the Southern Pacific as an assistant foreman in the Houston yards. He subsequently became an extra gang foreman and served in this capacity until December, 1912, when he returned to the Houston yards as general foreman. Promoted to roadmaster on the Mexia cut-off in 1914, he served in this capacity until the abolishment of this position three years later, when he again became foreman. In 1918 he was again appointed roadmaster, serving for two years in the vicinity of El Paso. Following this, he served consecutively as roadmaster, extra gang foreman and as general foreman on new track construction until February, 1921, when he obtained leave of absence. He returned in February, 1923, as an extra gang foreman at Ennis, and was promoted to general ballast foreman in February, 1924, the position he was holding at the time of his recent promotion to roadmaster.

Bridge and Building

W. C. Gibson, whose promotion to assistant supervisor of bridges and buildings of the Colorado division of the Union Pacific, with headquarters at Denver, Colo., was reported in the November issue, was born on December 31, 1883, at Denver, Colo., and entered railway service in May, 1912, as a bridge and building foreman on the Union Pacific, in which

capacity he served until May, 1916, when he resigned to become a foreman of a Denver construction company. He reentered the service of the Union Pacific in June, 1918, as a bridge and building foreman in the Denver, Colo., yard, where, on December 1, 1918, he was promoted to foreman of the maintenance of way repair shop. He was serving in this capacity at the time of his recent promotion to assistant supervisor of bridges and buildings.

Purchases and Stores

A. L. Tucker, assistant general storekeeper of the Chicago & North Western, with headquarters at Chicago, has retired on pension after 45 years of service with this road.

J. C. Neph has been appointed assistant district storekeeper of the Eastern district of the Southern Pacific, with headquarters at El Paso, Tex.

J. W. Cockrill has been appointed division storekeeper of the Illinois Central, with headquarters at Clinton, Ill., succeeding R. E. Downing, who has resigned to engage in other business.

R. G. Becker, division storekeeper of the Minnesota division of the Northern Pacific, with headquarters at Staples, Minn., has been transferred to the St. Paul division, with headquarters at St. Paul, Minn., succeeding **W. L. Peabody,** who has been assigned to reclamation work at Brainard, Minn. **E. L. Cates** has been appointed acting division storekeeper of the Minnesota division, succeeding Mr. Becker.

Obituary

E. E. Hart, consulting engineer of the New York, Chicago & St. Louis, with headquarters at Cleveland, Ohio, died in that city on December 4. An outline of Mr. Hart's railway career appeared in the March, 1924, issue.

Olaf Hoff, consulting engineer and at one time engineer of structures of the old New York Central & Hudson River, died on December 24, 1924, at his home in Montclair, N. J.

Joseph U. Crawford, who retired on September 1, 1912, at the age of 70, as consulting engineer of the Pennsylvania, died at his home in Fox Chase, Pa., on November 21. Mr. Crawford was born on August 25, 1842, at Philadelphia, Pa., and was educated at John W. Fairies' school at Philadelphia and at the University of Pennsylvania. He entered railway service in 1871 as senior assistant engineer of the Alexandria & Fredericksburg (now a part of the Pennsylvania), and later was promoted to principal assistant engineer. He was later appointed engineer of the California division of the Texas & Pacific, under Col. Thomas A. Scott, by whom he was sent to Japan as consulting engineer of the government. He remained in Japan until 1878 and upon his return to America he was employed by Jay Gould to make a transcontinental examination and surveys between the Pacific coast and Salt Lake, Utah, as well as in Wyoming and Nebraska. In the latter part of 1882 he entered the service of the Pennsylvania as chief engineer of the Pennsylvania-Schuylkill Valley. During 1886 and 1887 he built the Piedmont & Cumberland (now the Western Maryland), and in August, 1889, he was appointed assistant to J. N. Du Barry, second vice-president of the Pennsylvania, which position he held until the death of Mr. Du Barry, when he was made engineer of branch lines. From October, 1988, to May, 1899, he was appointed consulting engineer of the United States government to report on transportation facilities in Cuba. On April 8, 1902, he was appointed engineer of the New York Connecting Railroad, and from January 5, 1911, to September 1, 1912, he served as consulting engineer of the Pennsylvania, when, on the latter date, he retired under the pension regulations of the company.

During the month of December a fire destroyed the Grand Trunk elevator at Huron, Mich., containing 600,000 bushels of grain, with a loss estimated at $500,000; also the shops of the Southern near Knoxville, Tenn., where the estimated loss was $170,000.

Construction News

The Atchison, Topeka & Santa Fe is reported to be contemplating the construction of a roundhouse and machine shop at Gainesville, Tex. This company also contemplates the construction of an engine terminal, including an enginehouse and shop buildings, at Emporia, Kans.

This company has awarded a contract to Lundgren & Carlson, Topeka, Kan., for the construction of an addition to the eating house at Arkansas City, Kan., to cost $40,000, and has closed bids for the construction of a passenger station at Enid, Okla.

The Baltimore & Ohio has awarded a contract to the Bates & Rogers Construction Company for the construction of sub-stations at Atlantic Yard, South Beach and Grasmere, Borough of Richmond, New York City, in connection with the electrification of the Staten Island Rapid Transit, to cost approximately $50,000.

The Boston & Maine has awarded a contract to the Rowe Construction Company, Woodsville, N. H., for the construction of an ice house at Newport, Vt., to cost approximately $29,000.

The Canadian National plans the construction of a car repair and paint shop at St. Catherines, Ont., to cost $25,000.

The Central of Georgia has awarded a contract to the Ogle Construction Company, Chicago, for the erection of a reinforced-concrete coaling station at Millen, Ga., to cost approximately $45,000.

The Central of New Jersey has awarded a contract to the Arthur McMullen Company for cut stone for 44 piers on the new Newark bay drawbridge, to cost $30,800; to the Linde & Griffith Company for the construction of a concrete sewer at the company's Elizabethport, N. J., shops, to cost $27,000; and to Young & French for the construction of a new passenger sation at Somerville, N. J., to cost $73,779.

The Chicago, Burlington & Quincy contemplates the construction of an addition of 1,000,000 bushels capacity to its grain elevator at Kansas City, Mo., and has awarded a contract to Allison Stocker, Denver, Colo., for the construction of a freight house at Denver, reported in the October issue.

The Chicago, Milwaukee & St. Paul has begun the installation of a 436-foot steel swing span to replace the pontoon bridge and pile trestle on the east end of the Missouri river bridge at Chamberlain, S. D. The project will cost approximately $95,000.

The Chicago, Rock Island & Pacific will soon call for bids for the construction of a power plant at Shawnee, Okla.

The Cisco & Northeastern contemplates the construction of an extension to its line from Breckenridge, Tex., to Throckmorton, a distance of 40 miles.

The Clinchfield is reported contemplating the construction of a passenger station at Erwin, Tenn.

The Colorado & Southern contemplates the construction of a roundhouse at Fort Collins, Colo.

The Cowlitz, Chehalis & Cascade has completed surveys for the construction of a 14-mile extension to its line which now terminates at Lacamas, Wash.

The Duluth, Missabe & Northern will construct 10 miles of track at Hibbing, Minn., with the company forces.

The Eastern & Western Lumber Company has awarded a contract to J. F. Clarkson, Portland, Ore., for the construction of 21 miles of standard gage logging railroad from Molalla, Ore., into the timber land of the lumber company.

The Florida East Coast has authorized four second tracking projects, a 12.5-mile belt line and a 1.6-mile siding. The second tracking projects total 55 miles and will cost approximately $2,800,000. The two latter projects will cost approximately $450,000.

The Fruit Growers' Express will build a car repair shop at Oakland City, an industrial suburb of Atlanta, Ga.; approximate cost, $450,000.

The Illinois Central contemplates the construction of a freight and passenger station at Clarksdale, Miss., and has closed bids for the construction of a one-story brick freight station, 462 feet long, at Indianapolis, Ind. This company will also construct a large engine and car repair terminal at Markham Yard, Chicago, including a 48-stall roundhouse, machine shop, power house, together with cinder conveyors and sewer water lines. The contract for the construction of the foundations of the buildings and the laying of the pipe lines has been awarded to Joseph E. Nelson & Sons, Chicago.

This company plans the construction, next year, of steel and concrete bridges across its tracks at Jackson boulevard and at Ninth street, Chicago.

The Kansas City Southern has awarded a contract to the Goodlander Construction Company, Kansas City, Mo., for the construction of a passenger station at DeQuincy, La. and has awarded a contract to the Goodlander Construction Company for the construction of a passenger station at Lake Charles, La., to cost $22,000.

The Los Angeles Junction has applied to the Interstate Commerce Commission for authority to construct and operate an industrial switching line of 7.64 miles in Los Angeles County, Calif. This company has also applied to the Interstate Commerce Commission for authority to construct eight miles of line through the city of Vernon, Cal., to connect with the Southern Pacific and the Union Pacific.

The Michigan Central has closed bids for the removal of the superstructure of its old cantilever bridge over the Niagara river between Niagara Falls, N. Y., and Niagara Falls, Ont.

The Minneapolis, St. Paul & Sault Ste. Marie plans the construction of a second track from Wheeling, Ill., to Area, a distance of 10 miles. The construction of the passenger station at Area is also planned.

The Missouri Pacific has awarded a contract to the Railroad Water & Coal Handling Company, Chicago, for the construction of an oil station at Smackover, Ark., and contemplates the construction of an addition to the grain elevator at Kansas City, Mo., with a capacity of 500,000 bushels.

The Nashville, Chattanooga & St. Louis contemplates the construction, with company forces, of a roundhouse at Hollow Rock Junction, Tenn., to replace the building recently destroyed by fire with a loss of $20,000.

The New York Central has reached an agreement with St. Joseph county, Ind., to construct a subway to carry the Lincoln Highway under its tracks at New Carlisle crossing, 14 miles west of South Bend, Ind.

The New York, Chicago & St. Louis is reported to have awarded a contract to Green & Sawyer, Lima, Ohio, for the construction of a one-story machine shop extension, 68 feet by 82 feet, at Lima, Ohio.

The Norfolk & Western has under consideration extensions to its machine shops at Roanoke, Va., and Portsmouth, Ohio, and has awarded a contract to the Chicago Bridge & Iron Works for the furnishing and erection of two 100,000-gal. steel tanks at Kermit, W. Va. A contract for a 200,000-gal. tank, 22 feet 6 inches in diameter, to be erected at Prichard, Va., has also been awarded to this company.

The Northern Pacific has received a certificate from the Interstate Commerce Commisison authorizing the construction of an extension of the Elma branch from Stimson to Shelton, Wash., 15 miles.

The Pacific Fruit Express has closed bids for the construction of a refrigerator car repair shop, paint shop and stores shed at Nampa, Idaho, to cost $450,000, reported in the December issue.

The Pennsylvania has awarded a contract to Battey & Kipp, Inc., Chicago, for the construction of an engine house and repair shop at Toledo, Ohio, to cost approximately $500,000. This company has awarded a contract to the Eckstein-Kuglem Company, Wheeling, W. Va., for the construction of a brick passenger station, 25 feet by 75 feet, at Follansbee, W. Va., to cost $40,000. This building is now under construction. The Pennsylvania has also awarded a contract to the Dresser-Minton-Scobell Company, Cleveland, Ohio, for the construction of a passenger station, 30 feet by 130 feet, at Weirton, W. Va., to cost $40,000. This company has also awarded a contract to the Heyl & Patterson Company, Pittsburgh, Pa., for the superstructure for a 120-ton car dumper at Sandusky, Ohio, to cost approximately $400,000. Contract for the foundation has been awarded to the Hecker-Moon Company, Cleveland, Ohio, at an estimated cost of $250,000.

The Seaboard Air Line has awarded a contract for the construction of a station of brick exterior at Vidalia, Ga., including a platform 400 ft. long.

The Southern is reported planning the construction of new shop buildings at Knoxville, Tenn., to replace the shops recently destroyed by fire with a loss of $270,000.

The Southern Pacific is reported to be planning the construction of a passenger station at Sacramento, Cal., to be 128 ft. by 370 ft., three stories in height and of reinforced concrete and steel construction.

The St. Louis-Kansas City Short Line (Electric), which was recently incorporated in Missouri, plans the construction of a standard gage electric road, 238 miles long, from Kansas City, Mo., to St. Louis. The line will cross the Missouri river at Arrow Rock, Mo. Lee Dunlap and Frank E. Lott, Kansas City, Mo., are two of the incorporators.

The Texas & Pacific contemplates the construction of a freight and passenger station at Livonia, La.

The Union Pacific is reported planning the construction of extensions to its machine shop and roundhouse at Nampa, Idaho.

The Wabash is reported to have plans for the construction of locomotive and car repair shops and a large classification yard at Peru, Ind. The Missouri Supreme Court has upheld the order of the Missouri Public Service Commission, approving the plan of the city of St. Louis which calls for the depression of the railroad tracks and the building of a viaduct to carry Delmar boulevard, the city to pay 40 per cent and the Wabash 60 per cent of the estimated total cost of $538,000.

The Winston-Salem Terminal has awarded a contract to the North-Eastern Construction Company, Charlotte, N. C., for the construction of a three-story passenger station, 110 ft. by 120 ft., at Winston-Salem, N. C., to cost $800,000.

Equipment and Supplies

The Atchison, Topeka & Santa Fe has ordered 25,000 tons of structural steel for 1925 bridge work from the American Bridge Company and **The Atlantic Coast Line** has ordered 20,000 tons of rails from the United States Steel Corporation and 10,000 tons from the Bethlehem Steel Corporation

The Baltimore & Ohio has inquired for 1,500 tons of steel for four bridges.

The Chicago & North Western has ordered 27,000 tons of rails from the Illinois Steel Company, 7,000 tons from the Inland Steel Company and 7,000 tons from the Bethlehem Steel Corporation.

The Chicago, Burlington & Quincy is expected to buy 40,000 tons of rails soon, the New York, Chicago & St. Louis, 20,000 tons, and the St. Louis Southwestern, 11,000 tons.

The Detroit, Toledo & Ironton has ordered 3,000 tons of rails from Belgium.

The Illinois Central has ordered 6,400 tons of structural steel for shop buildings from the American Bridge Company and has inquired for 585 tons for its Burnside shop addition.

The International-Great Northern has ordered 12,000 tons of structural steel for oil storage tanks from the Kansas City Structural Steel Company.

Supply Trade News

General

The Pawling & Harnischfeger Company, Milwaukee, Wis., has changed its name to the **Harnischfeger Corporation.**

The Colorado Fuel & Iron Company will spend approximately $3,500,000 for improvements and enlargements during 1925.

Johns-Manville, Inc., will establish a plant in New Orleans, La., the first unit of which will be equipped and in operation by April.

The Joyce-Cridland Company, Dayton, Ohio, has opened an office in the Railway Exchange building, St. Louis, Mo., in charge of **R. C. O'Brien.**

The Cleveland Twist Drill Company, Cleveland, Ohio, plans the construction of one, two and four-story plant additions to its factory at Cleveland.

J. B. Marks, purchasing agent of the **Colorado Fuel & Iron Co.,** with headquarters at Denver, Colo., has also been appointed assistant to the president.

The McMyler Interstate Company has acquired from the **Fogarty Excavating Appliances Company, Inc.,** Rochester, N. Y., the right to manufacture and sell the Fogarty bucket.

The Linde Air Products Company has opened a branch office at Salt Lake City, Utah, in charge of **R. L. Strobel** and another office at Seattle, Wash., in charge of **C. E. Rheim.**

The Sullivan Machinery Company, Chicago, has established a branch office and warehouse in Los Angeles, Cal., at 442 East Third street, with **Benjamin P. Lane** as local manager.

The Milburn Sales Company, distributors in the Philadelphia territory for the Alexander Milburn Company, Baltimore, Md., makers of oxy-acetylene welding and cutting apparatus and portable carbide lights, has taken over the Metropolitan New York district, with headquarters at 309 Fifth avenue. **E. P. Boyer, D. Keyser** and other assistants will be in charge of the New York City office.

The McClintic-Marshall Company, Pittsburgh, Pa., has purchased the Morava Construction Company, which has a plant at Eighty-fifth and Stewart avenue, Chicago, and the Kenwood Bridge Company, which has a plant at 7749 Dante avenue, Chicago. The Morava Construction Company will be operated as the Morava works of the McClintic-Marshall Company, while the Kenwood Bridge Company will be operated as the Kenwood works of the McClintic-Marshall Company. President Morava will retire from active business. **Paul Willis,** president of the Kenwood Company, will be in charge of the Chicago district for the McClintic-Marshall Company as vice-president and manager.

The Ramapo Ajax Corporation has acquired the Elliot Frog & Switch Company, with headquarters at East St. Louis, Ill., and with plants at that point and at Pueblo, Colo. Effective January 1, these plants will be operated by the Ramapo Ajax Corporation, giving this company seven plants. **W. H. Elliot,** president of the Elliot Company, becomes a vice-president and director of the Ramapo Company, **Dickson Fairback,** vice-president of the Elliot Company, becomes vice-president of the Ramapo Company, both with headquarters at East St. Louis, and **W. J. Fairback,** vice-president of the Elliot Company, becomes vice-president of the Ramapo Company, with headquarters at Pueblo, Colo.

The Link-Belt Company, Chicago, has opened a warehouse and office at 5938 Linsdale avenue, Detroit, Mich.

Personal

Charles H. Bromly has been appointed manager of the lubrication and filtration division of **S. F. Bowser & Co.,** Ft. Wayne, Ind.

C. J. Thompson, district sales manager of the **Osgood Company,** with headquarters at Chicago, has been transferred to New York.

Albert E. Hay has been elected president and general manager of the **Fairbank Steam Shovel Company,** Marion, Ohio, to succeed **J. G. Fairbank,** president and treasurer, who has been elected a director. **Robert Carroll** has been elected vice-president, and **J. G. Davidson** has been elected secretary and treasurer.

Irwin V. Amerman has opened an office for the sale of iron and steel railroad supplies, also new and relaying rails, at 408 Frisco building, St. Louis, Mo.

B. B. Phillips resigned as general manager of the **Gifford-Wood Company,** Hudson, N. Y., and severed his connections with that organization on December 15.

D. E. Sawyer, formerly general sales manager of the Pollak Steel Company, New York, has been appointed vice-president of the **Wanner Malleable Castings Company,** Hammond, Ind.

J. F. Kroske has been appointed manager of pneumatic tool sales for the **Ingersoll-Rand Company** in the Pittsburgh territory, with headquarters at Pittsburgh, Pa.

R. D. Allrich, western sales manager of the **Blaw-Knox Company,** has been appointed sales engineer of the **Superior Supply Company,** Chicago, distributors of railway and industrial contractors' equipment.

C. S. Price, First National Bank building, Hazleton, Pa., has been appointed district representative for northeastern Pennsylvania of the **Conveyors Corporation of America,** Chicago. **E. E. Elliott** is associated with Mr. Price.

F. W. Glauser, formerly associated with the Mid-Continent Equipment & Machinery Co., St. Louis, Mo., is now manager of the equipment department in the southern territory of the **Hyman-Michaels Company,** with headquarters at St. Louis.

Anton S. Rosing, assistant manager of the advertising and publication bureau of the **Portland Cement Association,** Chicago, has been appointed publicity manager of the **Armco Culvert and Flume Manufacturers Association,** Middletown, Ohio, in charge of advertising, publications and other publicity work. Mr. Rosing is a civil engineering graduate of the University of Michigan. Previous to joining the staff of the Portland Cement Association he was engaged in active construction work, principally on railroads, and for two years was an assistant professor of civil engineering at the Michigan Agricultural College at Lansing, Michigan.

Trade Publications

Steel.—A 10-page letter-size booklet, entitled "A Moral Responsibility," has been issued by the Mississippi Valley Structural Steel Company which is devoted to the organization of the company and to a pictorial review of the recent buildings of various kinds for which this company has provided the steel and designing service.

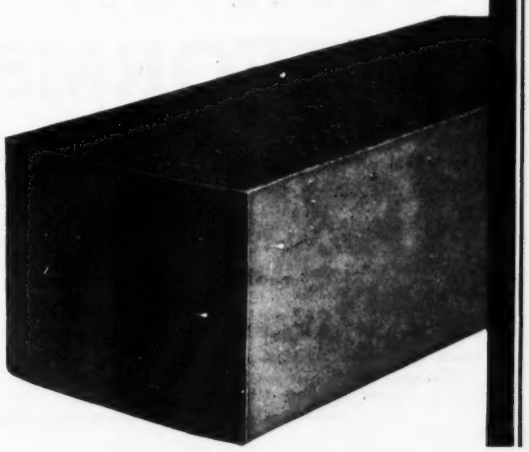
Steam Shovels.—The Osgood Company, Marion, O., has issued a 16 page pocket size booklet, entitled "Fifty-two Years of Experience," which comprises a history of the Osgood Company, including portrayal of the development of the shovels, the early types of which, as well as the present types, are illustrated.

Sand Dryers.—An eight page letter-size circular has been issued by the Roberts & Schaefer Company, Chicago, devoted to descriptions of its sand drying equipment, together with its gravity sand plant and other locomotive sanding equipment. Both diagrams and photographs are presented to illustrate the construction of the equipment and its operation.

How to Maintain Roads.—In a booklet of 78 pages, bound in fabrikoid, the Dow Chemical Company, Midland, Mich., presents a demonstration of the advantages of using Dowflake, a special form of calcium chloride, on macadam, earth and gravel roads, driveways or other exposed areas of these materials. The text covers the description of material, methods of application and the results obtained in reducing the dust nuisance. It is illustrated by a selection of unusually fine photographs, chiefly of highways.

Alton Brick Company
Alton, Ill.
Binghamton Brick Company
Binghamton, N. Y.
Cleveland Brick & Clay Company
Cleveland, Ohio
Clydesdale Brick & Stone Co.
Pittsburgh, Pa.
Coffeyville Vitrified Brick & Tile Co.
Coffeyville, Kans.
Collinwood Shale Brick Company
Cleveland, Ohio
Francis Vitric Brick Company
Boynton, Okla.
Georgia Vitrified Brick & Clay Co.
Augusta, Ga.
Globe Brick Company
East Liverpool, Ohio
Hisylvania Coal Co.
Columbus, Ohio
Hocking Valley Brick Company
Columbus, Ohio
Independence Paving Brick Co.
Independence, Kans.
Metropolis Paving Brick Co.
Pittsburg, Kans.
Metropolitan Paving Brick Co.
Canton, Ohio
Mineral Wells Paving Brick Co.
Mineral Wells, Texas
Moberly Paving Brick Company
Moberly, Mo.
Murphysboro Paving Brick Co.
Murphysboro, Ill.
Nelsonville Brick Co.
Nelsonville Ohio
Peebles Paving Brick Company
Portsmouth, Ohio
Purington Paving Brick Company
Galesburg, Ill.
Southern Clay Mfg. Company
Chattanooga, Tenn.
Springfield Paving Brick Company
Springfield, Ill.
Sterling Brick Company
Olean, N. Y.
Streator Clay Mfg. Company
Streator, Ill.
Thornton Fire Brick Co.
Clarksburg, W. Va.
Thurber Brick Company
Ft. Worth, Texas
Toronto Fire Clay Company
Toronto, Ohio
Trinidad Brick & Tile Company
Trinidad, Colo.
Veedersburg Paver Company
Veedersburg, Ind.
Western Shale Products Company
Fort Scott, Kans.
Westport Paving Brick Company
Baltimore, Md.

VITRIFIED
Brick
PAVEMENTS
OUTLAST THE BONDS



The Right Pavement

for Drives— Runways— Platforms—

Vitrified Brick

Long-lived—the rugged, fire-toughened brick surfaces laugh at abuse

Low upkeep—repairs are few and far between—and simple when necessary

Easily cleaned—reducing labor cost

Non-absorbent—oil, grease and water do not penetrate

Non-skid—man, beast and truck wheel find the best traction

Practically 100% salvage—when a yard is changed or a platform moved, the brick comes up easily and goes back to work unimpaired.

NATIONAL PAVING BRICK MANUFACTURERS ASSOCIATION
ENGINEERS BUILDING CLEVELAND, OHIO

Kyrock Crossing at West End of Union Station, Kansas City, Mo. Laid 1922

Kyrock Means Better Crossings, Longer Life, Less Labor, Lower Cost

Kyrock has met the demand of railway maintenance engineers for a long lived pavement that is simple to construct and maintain at a comparatively low cost. The best proof of its merit is the fact that Kyrock has been adopted by the leading railroads and, to our knowledge, no railroad which has once adopted Kyrock has ever reverted to any other material.

Simple to Construct

Kyrock is shipped in open top cars ready to lay. It is not subject to damage from the elements in transit and may be stored in the open even for a period of years. Kyrock is laid cold on any standard base. It is spread on the foundation, raked and tamped, and immediately opened to traffic. Ordinary section crews with tamps, rakes and shovels can maintain and construct Kyrock pavements. No special equipment or expert labor is required.

Easy to Maintain

No other type of pavement is as easy to maintain as Kyrock. When necessary to cut the Kyrock pavement for track repairs, the surface may be restored by filling the hole with Kyrock and tamping. The patch will bond to the surrounding surface and under normal traffic will iron out until it can not be distinguished. There is no mixing. There is no waste of material as it may be stored at points along the line and used as needed.

Resists Wear and Vibration

Kyrock is a high penetration asphalt, which explains why it is laid cold and why it bonds so readily to the base and surrounding surface. It is less susceptible to damage from vibration than any bituminous pavement. Vibration cracks and other breaks quickly heal under normal traffic. Kyrock does not lose its life because it is a natural product and because it is not subject to damage in mixing or heating. Often the old Kyrock surface may be broken up and used for making a patch.

Kyrock gives a smooth black surface, the same in appearance as sheet asphalt. It is a perfect waterproofing and insulation for the base and track construction. It is the nearest non-skid of any high type pavement.

Platforms, Floors, and Runways

Kyrock is extensively used for station platforms, shop floors and runways. It is easy to lay and maintain. It is resilient and non-glaring. It is also an ideal patching and re-surfacing material for brick and concrete surfaces.

Our engineering department has prepared specifications and cross sections for various railway constructions. We have also issued a book on the use of Kyrock for railway construction and maintenance. Write for Booklet R R 2.

Kentucky Rock Asphalt Company

Incorporated

Marion E. Taylor Bldg. **Louisville, Ky.**

Insist on Kyrock, the Uniform and Standard Kentucky Rock Asphalt

Buyers' Guide

CLASSIFIED INDEX TO ADVERTISERS

BUYERS' GUIDE

Out Houses.
Massey Concrete Products Corp.

Oxygen.
Air Reduction Sales Co.

Oxy-Acetylene Welding Equipment.
Air Reduction Sales Co.

Paint.
Dixon Crucible Co., Jos.

Paint, Metal Protecting.
Dixon Crucible Co., Jos.

Paint, Fire Resisting
Clapp Fire Resisting Paint Co.

Pavement Breakers.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Paving Brick
National Paving Brick Mfrs. Assn.

Penstocks.
American Valve & Meter Co.

Pile Drivers.
Industrial Works.

Piling.
International Creosoting & Constructing Co.
Massey Concrete Products Corp.

Pipe Carriers.
Massey Concrete Products Corp.

Pipe, Concrete.
Massey Concrete Products Corp.

Pipe, Corrugated.
Armco Culvert & Flume Mfrs. Assn.

Pipe, Sewer.
Massey Concrete Products Corp.

Pipe Joint Compound.
Dixon Crucible Co., Jos.

Platforms, Station.
Headley Good Roads Co.

Plows, Railroad.
Western Wheeled Scraper Co.

Poles.
International Creosoting & Construction Co.
Massey Concrete Products Corp.

Pony Car.
American Trackbarrow Co.

Posts, Bumping.
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Posts, Fence.
See Fence Posts.

Preservation, Timber.
International Creosoting & Construction Co.

Products, Gas.
Air Reduction Sales Co.

Pumps, Air Pressure and Vacuum, Centrifugal, Deep Well, Piston, Plunger, Rotary, Sump.
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Goulds Manufacturing Co.
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Hyatt Roller Bearing Co.

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Woolery Machine Co.

Rail Anchors.
Lundie Engineering Corp.
P. & M. Co.

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Rail Benders.
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Verona Tool Works.

Rail Bonds.
Verona Tool Works.

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Q. & C. Co.
Ramapo-Ajax Corp.
Wharton Jr. & Co., Wm.

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Q. & C. Co.

Rail Springs.
Verona Tool Works.

Rail, Tee.
Bethlehem Steel Co.

Regulators, Oxy-Acetylene.
Air Reduction Sales Co.

Removers, Paint.
Mudge & Co.

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Bethlehem Steel Co.

Rods, Welding.
Air Reduction Sales Co.

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Hyatt Roller Bearing Co.

Roof Slabs.
Hyatt Roller Bearing Co.

Roof Slabs.
Massey Concrete Products Corp.

Roofing Composition.
Barber Asphalt Co.
Lehon Co.

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Lufkin Rule Co.

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American Saw Mill Machinery Co.

Saws, High Speed Friction.
American Saw Mill Machinery Co.

Saw Rigs.
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Lufkin Rule Co.

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Western Wheeled Scraper Co.

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Sheet Iron.
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Lehon Co.

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Ames Shovel & Tool Co.

Signal Foundations, Concrete.
Massey Concrete Products Corp.

Skid Shoes
Q. & C. Co.

Slabs, Concrete.
Massey Concrete Products Corp.

Smoke Stacks.
Chicago Bridge & Iron Works.
Massey Concrete Products Corp.

Snow Melting Device
Q. & C. Co.

Snow Plows
Q. & C. Co.

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Ames Shovel & Tool Co.

Spikes.
Bethlehem Steel Co.

Spreader Cars.
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Standpipes.
Chicago Bridge & Iron Works.

Standpipes (Penstock).
American Valve & Meter Co.

Stands, Switch & Target.
American Valve & Mater Co.
Bethlehem Steel Co.
Q. & C. Co.
Ramapo-Ajax Corp.

Station Houses.
Massey Concrete Products Corp.

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Steel Plates & Shapes.
Bethlehem Steel Co.

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Kilby Frog & Switch Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

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American Valve & Meter Co.

Switchmen's Houses.
Massey Concrete Products Corp.

Switchstands & Fixtures.
American Valve & Meter Co.
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

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Tanks, Oil Storage.
Chicago Bridge & Iron Works.

Tanks, Water Storage.
Chicago Bridge & Iron Works.

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Telegraph Poles.
See Poles.

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Tie Plate Clamps
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Tie Plates.
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Lundie Engineering Corp.

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Tools, Acetylene Cutting & Welding.
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Tools, Pneumatic.
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Verona Tool Works.
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Tools, Wrecking.
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Bethlehem Steel Co.
Frog Switch & Mfg. Co.
Kilby Frog & Switch Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Torches, Oxy-Acetylene Cutting & Welding.
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Track Barrows.
American Trackbarrow Co.

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Kalamazoo Railway Supply Co.

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Track, Portable.
Western Wheeled Scraper Co.

Track Tools.
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Transfer Tables.
Industrial Works.

Treating Plants, Water.
American Water Softener Co.

Trestle Slabs.
Massey Concrete Products Corp.

Valves, Float.
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Valves, Tank.
American Valve & Meter Co.

Ventilators
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Washers, Fibre.
Diamond State Fibre Co.
Whall Co., C. H.

Water Columns.
American Valve & Meter Co.

Water Cranes.
American Valve & Meter Co.

Water Softening Plants.
American Water Softener Co.

Water Treating Plants.
American Water Softener Co.

Water Tanks.
Chicago Bridge & Iron Works.

Water Treating Tanks.
Chicago Bridge & Iron Works.

Waterproofing Fabrics
Barber Asphalt Co.
Lehon Co.

Welding, Oxy-Acetylene.
Air Reduction Sales Co.

Welding & Cutting Equipment.
Air Reduction Sales Co.

Wheels, Hand & Motor Car.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
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Woolery Machine Co.

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Cyclone Fence Co.

Wood Grapples.
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Woodworking Machinery.
American Saw Mill Machinery Co.

Wrecking Cranes.
Industrial Cranes.

ALPHABETICAL INDEX TO ADVERTISEMENTS

Finger-Bolts Are Practicable With Verona Rail Joint Springs

FINGER-FREE BOLTS eliminate fractional threads, making it possible to turn the nut all the way up with the fingers.

The use of these bolts with Verona Rail Joint Springs, is the latest development in track joint maintenance. They make wrenching easier and insure a tight joint with equal distribution of load over the four bolts.

It has never been practicable to use them with coil nut locks because of insufficient pressure and reactive range, but they may be used with Verona Rail Joint Springs which exert high pressure through a range of one-eighth inch.

The combination of Finger-Free bolts with Verona Rail Joint Springs produces joints that are uniformly tight throughout their entire length—and will keep them tight.

This is another triumph of the Verona Rail Joint Spring—the greatest joint fastening ever produced.

VERONA TOOL WORKS

Pittsburgh, New York, Chicago, Boston, St. Louis, San Francisco, New Orleans, Washington, St. Paul, Denver